

Prepared for:
National Grid
Brooklyn, New York

Remedial Investigation Work Plan

Metropolitan Former MGP Site
Brooklyn, New York
NYSDEC Site No.: 224046
Order on Consent Index #: A2-0552-0606

AECOM, Inc.
May 2009
Document No.: 01765-075

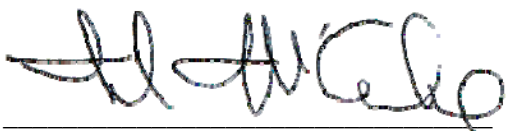
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Executive Summary

This Remedial Investigation Work Plan (RIWP) has been prepared for National Grid USA (National Grid) by AECOM Environment (AECOM) for a site located at 124 - 136 2nd Avenue in Brooklyn, New York (Site). This site, known as the Metropolitan former MGP Site, was the former location of a manufactured gas plant (MGP) that was operated by Brooklyn Union Gas Company (BUG), a predecessor company to National Grid, from the late 1880s until approximately 1938.

A portion of the site was the subject of previous extensive remedial/redevelopment activities undertaken by independent third parties with NYSDEC oversight. This RIWP details investigation activities for those portions of the site that were not addressed by the previous remedial/redevelopment activities. The site areas to be investigated in the current RIWP are completely developed in commercial use and include various retail operations and parking lot areas.

Results from the prior investigation activities at the site provide the following information:

- The site area formerly contained a tidal stream (that is now the navigable Gowanus Canal) and adjacent salt marsh that formed on a glacial outwash plain.
- Site soils are comprised of fill containing coal ash (surface to 16 feet below ground surface (bgs); a semi-confining “meadow mat” layer comprised of peat, clay, and silt (16 to 18 ft bgs); and a mixture of sands, clays, and silts with some gravel (to approximately 80 ft. bgs).
- Two aquifer zones have been identified at the site, including a water table aquifer within fill material above the meadow mat layer, and a lower aquifer beneath the meadow mat layer. Strong downward gradients exist between the water table and lower aquifers. Wells in proximity (approximately 300 feet) to the Gowanus Canal are tidally influenced in both aquifer zones.
- The construction of several of the former MGP structures penetrated the semi-confining “meadow mat” layer, providing a downward conduit for migration of residual coal tar. Although former MGP structures were addressed during the previous remedial activities (excavation and installation/operation of recovery wells), residual material has been identified at depths of approximately 65 to 70 feet bgs in portions of the site.

The investigation presented in this RIWP will focus on the delineation of residual coal tar and associated soil impacts and dissolved phase impacts in groundwater, and will have the following objectives:

- To collect additional data to more completely determine the surface and subsurface characteristics of the site.
- To determine the nature and extent of MGP-related residuals that are present at the site and surrounding areas in soils, soil vapor, and groundwater.
- To identify the potential routes of off-site migration from on-site sources of MGP-related residuals.
- To perform an exposure assessment to evaluate the pathways by which human receptors (either on-site or off-site) may be exposed to MGP-related residuals.
- To further develop the dataset necessary to allow preparation of a Feasibility Study to evaluate remedies that will eliminate the potential threat to public health or the environment posed by the site.

The program will provide for the collection/analysis of the following samples:

- Approximately 66 soil samples
- Approximately 20 groundwater samples
- Vapor intrusion samples including sub-slab soil gas, indoor air and ambient background

Sufficient flexibility will be incorporated into the project scope to allow additions to, or modifications of proposed investigation locations in real time to better delineate the nature and extent of MGP residuals in various media (soil, soil vapor/indoor air, and groundwater).

The results from the program will be compiled into a comprehensive report to provide a delineation of MGP impacts and an evaluation of potential risk. The information will be appropriate for the evaluation of potential remedies for the site.

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1.0 Introduction

This Remedial Investigation (RI) Work Plan has been prepared for National Grid USA (National Grid) by AECOM Environment (AECOM) for a site located at 124 - 136 2nd Avenue in Brooklyn, New York (Site). The location of the site is shown on Figure 1-1. This site, known as the Metropolitan former Manufactured Gas Plant site was the former location of a manufactured gas plant (MGP) that was operated by Brooklyn Union Gas Company (BUG), a predecessor company to National Grid, from the late 1880s until approximately 1938. A portion of the site has been extensively investigated and remediated under New York State Department of Environmental Conservation (NYSDEC) Spill numbers 9214380, 9704147, and 0107907, also known as the USPS Gowanus Site (Site No.: V00405-2), performed by FC Gowanus Associates, LLC. FC Gowanus Associates performed the work prior to property redevelopment at a portion of the former MGP site. The NYSDEC issued a Case Closure Letter for this work with stipulations on property use, including a requirement for ongoing operations, monitoring, and maintenance (OM&M) of site recovery wells. A summary their work and other historical investigation and remediation documents is discussed in later sections and summarized in Appendix A.

The investigation is being conducted by National Grid pursuant to a Multi-site Order on Consent and administrative settlement with the NYSDEC, Index # A2-0552-0606, which was executed in February 2007, and in accordance with applicable guidelines of the NYSDEC, the New York State Department of Health (NYSDOH), the United States Environmental Protection Agency (USEPA) and the National Contingency Plan (NCP).

This RI Work Plan presents the project objectives, provides background information regarding historical site use and current conditions, summarizes the results of previous investigations, and outlines the strategies and methodologies that will be implemented during the investigation. The following four appendices have been developed which detail the procedures and protocols outlined in this Work Plan:

- The Field Sampling and Analytical Plan (FSAP) provides information regarding field sampling methods and procedures that will be used during the investigation.
- The Quality Assurance Project Plan (QAPP) specifies the quality assurance/quality control procedures that will be implemented during the fieldwork and in the laboratory which performs the chemical analyses of the samples collected during the RI.
- A Community Air Monitoring Program (CAMP) provides information regarding the procedures to be used to monitor and control, if necessary, the potential release of airborne constituents at the downwind perimeters of the investigation work areas. Included in the CAMP are procedures regarding the control of odors that may be present as a result of the intrusive site investigation activities.
- A Site-Specific Health and Safety Plan (HASP) has been prepared to outline procedures that will be undertaken to protect site workers and visitors from potential hazards that may exist as a result of the fieldwork performed at the site.

1.1 Project objectives

A site inspection and planning visit meeting was conducted by AECOM, National Grid, and the NYSDEC on December 2, 2008 to facilitate agreement of the RI objectives and scope presented in this Work Plan.

In summary, the objectives of the RI include the following:

- Collect additional data to more completely determine the surface and subsurface characteristics of the site.

- Determine the nature and extent of MGP-related residuals that are present at the site and surrounding areas in soils, soil vapor, and groundwater at locations not previously addressed as part of the FC Gowanus, LLC work presented above.
- Identify the potential routes of off-site migration of MGP-related residuals from on-site sources.
- Perform an exposure assessment to evaluate the pathways by which human receptors (either on-site or off-site) may be exposed to a MGP-related residuals.
- Further develop the dataset necessary to allow preparation of a Feasibility Study to evaluate remedies that will eliminate the threat to public health or the environment posed by the site.

It was also agreed during the December 2, 2008 planning meeting with NYSDEC representatives that sufficient flexibility would be incorporated into the investigation scope to allow additions to or modifications of investigation locations proposed in this document. Such changes may be required in real time to better delineate the nature and extent of MGP residuals in various media (soil, soil vapor/indoor air, and groundwater). Any modifications to the work presented herein would be made following consultation with National Grid and NYSDEC oversight personnel prior to work being performed.

1.2 Work plan organization

Following this introduction, the remainder of this Work Plan describes the proposed RI activities.

- Section 2 – provides a description of the site, summary information regarding site ownership and operational history, and the results of the previous investigation work performed at the site.
- Section 3 – presents the objectives for the investigation followed by a description of the specific tasks that will be undertaken to gather sufficient information to meet the project objectives.
- Section 4 – describes the companion documents that are included as appendices to this Work Plan, including the FSAP, QAPP, CAMP, and HASP.
- Section 5 – describes the Qualitative Human Health Exposure Assessment to be completed based on data collected during the RI that will be included as part of the RI Report.
- Section 6 – presents the approximate project schedule, with key milestones.
- Section 7 – provides a list of the references cited in the Work Plan.

Appendices to the Work Plan include the following:

- A summary of previous investigation reports and Sanborn Maps are included in Appendix A.
- Previous investigation soil boring and well completion logs are included in Appendix B.
- The FSAP is included as Appendix C.
- The QAPP is included as Appendix D.
- The CAMP is included as Appendix E.
- The HASP is included as Appendix F.
- The previous investigation reports are included as Appendix G (CD-ROM).

2.0 Site description and history

This section presents a description of the site, summary information regarding site ownership and operational history, and summarizes the results of the previous investigation work.

2.1 Site description

The Metropolitan former MGP site is located at 124 – 136 2nd Avenue, Brooklyn, Kings County, New York 11215, east of the Gowanus Canal, between the Gowanus Expressway (Highway 278) and the New York City Transit train bridge and associated subway rail line. The site is bounded by 10th Street and 11th Street to the north, 2nd Avenue to the east, 13th Street to the south, and the Gowanus Canal to the west. The location of the site and the surrounding features are shown on an aerial photograph on Figure 2-1.

A portion of the site was the subject of previous extensive remedial/redevelopment activities undertaken by independent third parties with NYSDEC oversight. This RIWP details investigation activities for those portions of the site that were not addressed by the previous remedial/redevelopment activities, i.e. the “Current Site”. The Current Site is comprised of the following seven parcels of land:

Block/Lot Number	Owner's Name and Address	Operator's Name and Address	Status
Block 1007 Lot 172	Hamilton Plaza Associates 560 Sylvan Avenue Englewood Cliffs, NJ 07632	1 – 27 12 th Street Extension or 2 11 th St. Brooklyn, NY 11215	Currently a retail shopping plaza (strip mall) including a large grocery store (Pathmark) and small retail shops.
Block 1007 Lot 269	Department of Business Services 110 Williams Street New York, NY 10038	12 th St. Brooklyn, NY 11215	Currently part of the retail shopping plaza. Parcel contains a permanent sewer easement.
Block 1025 Lot 16	Hamilton Plaza Associates 560 Sylvan Avenue Englewood Cliffs, NJ 07632	22 – 42 12 th St. or 21–41 13 th St. Brooklyn, NY 11215	A parking lot, currently part of the retail shopping plaza.
Block 1025 Lot 18	Hamilton Plaza Associates 560 Sylvan Avenue Englewood Cliffs, NJ 07632	Hamilton Place Brooklyn, NY 11215	Part of the retail shopping plaza as part of the parking lot. Parcel contains an easement.
Block 1025 Lot 20	Presumed to be Hamilton Plaza Associates 560 Sylvan Avenue Englewood Cliffs, NJ 07632	Hamilton Place Brooklyn, NY 11215	Presumed to be part of the retail shopping plaza as part of the parking lot.
Block 1025 Lot 100	Hamilton Plaza Associates 560 Sylvan Avenue Englewood Cliffs, NJ 07632	50 12 th Street Brooklyn, NY 11215	Currently a retail parking lot selling used automobiles.
Block 1025 Lot 26	Hamilton Plaza Associates 560 Sylvan Avenue Englewood Cliffs, NJ 07632 and New York City Economic Development Corporation	60 12 th Street Brooklyn, NY 11215 and 110 William Street New York, NY 10038	Currently a two-story maintenance garage/retail offices.

Current and historic site features are shown on Figure 2-2. Figure 2-3 provides a map showing the locations of the parcels listed above as well as other adjacent properties.

2.1.1 Adjacent properties

The Current Site is bounded by the Gowanus Canal to the west, beyond which are commercial properties. Southeast of the property is 2nd Avenue, beyond which are commercial and residential properties. To the southwest is 13th Street, commercial properties and the Gowanus Expressway (Highway 278). To the north and east of the site lie the properties that were previously remediated by a third party under NYSDEC supervision and redeveloped as a Lowe's Supply Store (Block 1007, Lots 118, and 220), and associated parking lots (Block 1007, Lots 1 and 219). To the south of the site lie two properties (Block 1025, Lots 1 and 52) that were previously part of the Brooklyn Alcatraz Asphalt Company. A summary of environmental database search records for these and other local properties is provided in Table 2-1.

2.2 Site history

A review of the historical information available for the Metropolitan former MGP site (Current Site and previously remediated areas) has been performed with the results summarized in a report prepared by Nelson, Pope & Voorhis, LLC (NP&V) entitled "*Phase I Environmental Site Assessment*", dated May 15, 1997 (NP&V, 2003). The report included a review of the historic Sanborn Fire Insurance maps for the site as well as other available information (including tax records, zoning records, and United States Geologic Society (USGS) Topographic Maps). A copy of the Sanborn maps are included in Appendix A, and a summary of the historical information obtained from these sources is presented in Table 2-2. The following section discusses site usage based on a review of Sanborn maps covering the 110 year period of 1886 through 1996.

In 1886, portions of current Block 1007 (the block bounded by 2nd Avenue, 9th Street, 12th Street and the Gowanus Canal) were occupied by the Metropolitan Gas Light Company (listed as storage only on the 1886 Sanborn map). Buildings included a coal shed, gasometer (No. 1 holder), and retorts. By 1904, the site was identified as the Metropolitan Works Branch, owned by BUG, and the MGP had been expanded to the east to include two additional holders (Holders 2 and 3) with gas manufacture infrastructure in the western portion of the site (closer to the canal) having been improved.

Historical records suggest that the site operated as a coal gas plant prior to 1915, by which time the plant appears to have been converted to a carbureted water gas process, an additional hydrogen holder (Holder 4) as well as oil storage tanks, located east of Holder 2, being present. By 1915, the facility had been expanded south onto a portion of Block 1025 (the block bounded by 12th Street, 13th Street, 2nd Avenue and the Gowanus Canal), where a large distribution holder (Holder 5) was located. An asphalt plant (Brooklyn Alcatraz Asphalt Company) is shown to be located adjacent to the former MGP on two separate parcels.

By 1938, most of the operating structures and Holders 1 through 3 had been removed and the site was listed as the BUG "12th Street Holder Department", suggesting that gas manufacturing had ceased and the site was used for gas storage only. At this time, the Ernst Zobel Pitch Paint Manufacturing Plant was reportedly in operation adjacent to and northeast of the site. However, the adjacent Brooklyn Alcatraz Asphalt Company was no longer in operation.

By 1950, the north-eastern portion of the former MGP was listed as housing the US Post Office Garage and Repair shop, with some former MGP structures (a coal bunker where relief Holder 4 was previously located and a boiler house) still existing closer to the Gowanus Canal on the western portion of the site. The southern portion of the former MGP still housed Holder 5 and the exhaust house, with the parcel listed as a storage area for old electric cables.

By 1969, all former MGP structures had been removed from the surface of Block 1007, and a food products warehouse was present adjacent to the Gowanus Canal, in the western section of the former MGP. However BUG was still listed as the owner of the parcels on Block 1025, where Holder 5 was still present. By 1972, all structures from the former MGP had been removed from the surface of the site. Sanborn maps from 1982 through 1996 show no major changes in site usage, with the US Postal Service, the food products warehouse, and parking covering the footprint of the former MGP.

The eastern portion of the MGP (Block 1007, Lots 219 and 220) and two adjacent parcels (Block 1007, Lots 1 and 218) were investigated and remediated through extensive excavation of the former oil tanks and Holders 1 through 3. In addition, approximately 44 recovery wells were installed to allow recovery of free phase non-aqueous phase liquid (NAPL). This work, completed in 2003 by FC Gowanus, LLC, allowed the eastern portion of the former MGP and the two adjacent parcels to be closed under NYSDEC oversight in September 2003. The remediation/closure of these areas, with subsequent redevelopment as a Lowe's Supply Store, provides the basis for the definition of the Current Site. Recent information on the Current Site is limited to a Tank Closure Report and a Phase II, both dated 2007, for a maintenance and garage facility (Block 1025, Lot 26 [60 12th Street]). A list of available information related to the spill is provided in Appendix A.

2.3 Previous investigation work

Previous investigation activities have occurred at the Metropolitan MGP site (Current Site and previously remediated areas) between 1997 and 2007. A list of previous reports reviewed is provided in Appendix A and a copy of each report is provided in Appendix G. Information provided in these previous reports has been summarized in a series of figures, as outlined below:

- Figure 2-2 illustrates the locations of previous investigation locations, including surface soil, subsurface soil, monitoring wells and soil vapor locations. The majority of these locations are located near the southern portion of the main former MGP parcel, where three former gas holders (Holders 1 through 3) and historic above ground oil storage tanks (ASTs) and underground storage tanks (USTs part of the former US Postal Service building) were located. Also summarized on Figure 2-2 are areas that have been remediated and closed.
- Figure 2-3 shows the locations of the various parcels comprising the maximum extent of the former MGP site and the Current Site (defined previously), which does not include the parcels previously investigated and remediated (Block 1007, Lots 1, 118, 219, and 220).
- Figure 2-4 shows locations where analytical laboratory data was generated from the locations shown in Figure 2-2. Note that several of the locations are within the areas that have been remediated. Table 2-3 through Table 2-5 provide summaries of the laboratory analytical parameters from the previous investigations.
- Figures 2-5 through 2-8 show locations where visible impacts were noted at various depths during previous investigation activities. Figure 2-5 shows visible impacts from locations ranging from the ground surface to 15 feet (ft) below ground surface (bgs). Visual impacts include coal tar impacted soil, a soil horizon described as a "black layer" in previous reports, or non-aqueous phase liquid (NAPL)/visible hydrocarbon impacts. Figures 2-6, 2-7, and 2-8 show NAPL impacts from 15 to 30 ft bgs, 30 to 50 ft bgs, and greater than 50 ft bgs, respectively. Figure 2-7 also shows locations where elevated hydrocarbon readings were detected when samples were screened with a photoionization detector (PID). Locations where no visible impacts were observed are also shown on these figures.
- Recovery well locations are shown on Figure 2-2. Note that many of the investigation locations, including monitoring wells, have been removed due to excavation activities associated with the FC Gowanus LLC work. The only remaining monitoring wells include the recovery wells (denoted by RW) RW-1 through RW-44 (located along the western edge of the current Lowe's Home Supply building) and three 4-inch monitoring wells (possibly including AMW-1 and AMW-2) located along 2nd Avenue near the intersection with 12th Street.

2.4 Site physical characteristics

Information obtained during the previous site investigations regarding the site topography, geology, and hydrogeology is summarized in the following sections.

2.4.1 Site topography and drainage

The ground surface in the area of the former MGP operations is approximately 10 ft above mean sea level (amsl). The area has been significantly altered due to industrial activities over the last century, and has likely been re-graded many times. The topography at the site is level, with a slight slope towards the Gowanus Canal, which forms the western boundary of the property and is classified as a NYSDEC Class D (SD) water body. The designated uses for a Class SD waters (the most degraded saline water body classification; GEI, 2007b) is for fishing and fish survival. Surface drainage generally follows surface topography, and is managed through an onsite storm water drainage system. Numerous outfall pipes have also been documented entering the Gowanus Canal (GEI, 2007b) from areas nearby the site.

2.4.2 Site geology

According to Mueser Rutledge (2002), the site area formerly contained a tidal stream (that is now the navigable Gowanus Canal) and adjacent salt marsh that formed on a glacial outwash plain. Gradual infilling of the salt marsh with fill materials (reported by ATC, 2007 to be largely comprised of coal ash from New York City incinerators) formed the current land surface. Bedrock at the site is reportedly over 150 feet below ground surface (bgs). Mueser Rutledge (2002) also report that glaciation initially scoured the existing soils over bedrock and deposited a relatively thick sequence of coarse grained outwash deposits (sands, gravels, and boulders) that were overlain by more recent glacially deposited marine clays (Gardiners Clay). The Gardiners Clay is overlain by sands, clays, and silts with some gravel. These deposits are present beneath a laterally continuous "meadow mat" layer comprised of peat, clay, and silt present at approximately 16 to 18 ft bgs. The meadow mat layer is approximately 2 ft thick in the eastern portion of the site, and increases in thickness to approximately 10 ft near the Gowanus Canal (AKRF, 2001). This meadow mat layer appears to be continuous across the site and reportedly forms the bottom layer of the Canal.

Available boring logs and well construction diagrams summarizing subsurface geology from previous investigation activities are provided in Appendix B.

2.5 Site hydrogeology

Water level measurements obtained during previous investigations indicate that the groundwater table is approximately 3 to 10 ft bgs (AKRF, January 2001). The existence of the meadow mat layer reportedly serves as semi-confining layer between the upper water table aquifer present in fill materials and a lower aquifer present in the glacial outwash deposits beneath the site. Previous investigation data (AKRF, July 2001) indicated a strong downward gradient between the upper and lower aquifers in most site wells, with the exception of well locations adjacent to the Gowanus Canal, where the downward vertical gradient was less pronounced. The upper aquifer flows toward the northwest with a head difference of over six ft between the eastern boundary of the site (at 2nd Avenue) and the Gowanus Canal. Groundwater flow in the lower aquifer appeared to flow in a more northerly direction, which a much lower gradient (less than one ft between 2nd Avenue and the Gowanus Canal; AKRF, July 2001).

Tidal fluctuations were measured in 2001 and indicated that in the lower aquifer water levels correlated with the New York harbor tides, fluctuating 0.5 ft during a complete tidal cycle at wells adjacent to and up to 350 feet east of the canal. In the upper aquifer, areas of the site closest to the canal were reported to be tidally influenced, but not at a shallow well location approximately 350 feet east of the canal (AKRF, July 2001).

3.0 Remedial investigation objectives and field activities

The overall objectives for the RI are to complete the investigation of the Current Site and lay the groundwork for the selection of a site remedy. The areas of the former Metropolitan MGP site to be investigated include:

- The former MGP structures on the western portion of the main MGP parcel where the Hamilton Plaza is currently located.
- The southern portion of the former MGP, which housed Holder 5 and additional gas storage (valve house) facilities.
- Along 12th Street between the Gowanus Canal and 2nd Avenue, adjacent to several former MGP structures.
- One upgradient area near the intersection of 12th Street and 2nd Avenue, and
- The downgradient property boundary areas along 13th Street and the Gowanus Canal.

The specific objectives for the RI and the activities that will be undertaken to meet these objectives are discussed below. The discussion of investigation activities has been grouped by environmental media of concern or field task in the following sections.

3.1 Underground utility clearance

Prior to the start of any intrusive fieldwork, clearance of underground utilities will be performed. The drilling subcontractor will contact Dig Safely New York to arrange for the location and marking of all underground utilities in the vicinity of the proposed soil boring and monitoring well locations. Copies of available city sewer and water maps from the site vicinity will also be obtained and reviewed during underground utility clearance procedures. Following review of the utilities in the site area, AECOM will contract a private company to locate all underground electric and gas utilities in the vicinity of each proposed subsurface sampling location using geophysical methods. Outlying areas where information is required to confirm the location of suspected utilities that may act as preferential migration pathways may also be surveyed using geophysical methods. Lastly, all boring/well locations will be hand or vacuum excavated to a depth of five feet to check for potential utilities not located by Dig Safely or geophysical methods.

3.2 Test pit excavation

Given the limited access in a number of areas of the site, the use of test pits will be focused in and around former Gas Holder No. 5 (Figure 3-1). Table 3-1 provides a summary of the proposed test pits, their designations, sampling rationale, the anticipated test pit excavation depth, and the number and type of the laboratory samples to be collected. The test pits will be excavated with a backhoe or excavator using methods presented in the FSAP (Appendix C), with samples collected from the bucket of the excavator. Details for the logging of the test pits and proposed analyses are provided in Section 3.4. In summary, the open excavations will be surrounded by temporary barricades to prevent unauthorized personnel from entering the excavation area and to protect site traffic. Soil removed during the excavation of each test pit will be temporarily stored on sheet plastic for return to the excavation. To the extent possible, clean soil will be segregated from impacted soil. Upon completion of each test pit, lightly impacted soil and debris will be returned to the excavation first, followed by clean soil and any additional clean backfill needed to return the excavation to original grade. Grossly contaminated material will not be returned to the excavation, but will be containerized and managed as investigation derived waste (IDW).

3.3 Surface soil sampling

Site reconnaissance has indicated that there are minimal areas of exposed surface soil at the Site. At a minimum, one surface soil sample will be collected from each of these areas. For purposes of this investigation, three surface soil samples have been proposed (SS-1 through SS-3) on Table 3-1. One known area of exposed surface soil is within a small parcel of land between the Hamilton Plaza building and the Gowanus Canal, where exposed soil and mixed vegetation were noted. In addition, there is an unpaved area adjacent to, and potentially within the defined Site, between the current Lowes building and Hamilton Plaza and a vegetated area approximately 10-12 feet wide adjacent to and northeast of the Hamilton Plaza and the Gowanus Canal bulkhead. Available surveying data will be used to determine if portions of these areas are within the defined Site boundary. Based on these findings, proposed sample SS-1 will be collected from the 0 to 2-inch bgs interval at the SB-9/MW-9 location using a steel shovel and stainless steel or disposable polyethylene trowel. The specific locations of proposed surface soil samples SS-2 and SS-3 have not been identified on Figure 3-1 since their selection will depend on field conditions (e.g. obstructions, proximity to paved surfaces) and identified areas of exposed surface soil within the defined Site. Final locations of these surface soil samples will be confirmed with NYSDEC prior to collection. In the event that the parcel between the Hamilton Plaza building and the Gowanus Canal is the only area of identified surface soil, it is proposed that the remaining two samples (SS-2 and SS-3) be collected in this area. As shown in Table 3-1, surface soil samples will be analyzed for volatile organic compounds (VOCs) using US Environmental Protection Agency (USEPA) Method 8260B, semi-volatile organic compounds (SVOCs) using USEPA Method 8270C, RCRA 8 metals using USEPA Methods 6010 and 7000-series, and free cyanide (extraction by EPA method 9013A and analysis by Microdiffusion, ASTM International method D4282-02). One surface soil sample (SS-1) will be analyzed for the full Target Compound List (TCL) VOCs, SVOCs, pesticides (USEPA Method 8081A), herbicides (USEPA Method 8151A), PCBs (as Aroclors; USEPA Method 8082), Target Analyte List (TAL) metals, and free cyanide ASTM International method D4282-02. Additional information regarding the soil sampling methods and laboratory analyses is presented in the FSAP and QAPP.

3.4 Subsurface soil sampling and well installation

Subsurface soil borings will be advanced in order to obtain additional information regarding the thickness and composition of fill beneath the site; to determine the depth to the water table; to observe and screen subsurface soil in order to identify conditions that may be indicative of impacts by MGP or other residuals; and to install the monitoring wells proposed for the RI.

The locations of the proposed soil borings and wells are shown on Figure 3-1. Table 3-1 provides summary information regarding the borings and wells, including the boring or well designation, the sampling location or rationale, the anticipated completion depth, and the laboratory analyses to be performed. A total of 18 soil borings are proposed, with nine locations proposed for conversion to monitoring wells (shallow/intermediate well pairs or shallow/intermediate/deep well triplets). It was also agreed during the December 2, 2008 planning meeting and follow-up conversations that sufficient flexibility would be incorporated into the investigation scope to allow additions to, or modifications of proposed boring and well locations. For example, it was agreed that a minimum of one additional location will be installed northeast of the Pathmark building (which includes other merchants), on Lot 172, if survey indicates there is sufficient room between the building and the lot line. Such changes may be required in real time to better delineate the nature and extent of MGP residuals in subsurface soils and groundwater. Any modifications to the work presented herein would be made following consultation with National Grid and NYSDEC oversight personnel prior to work being performed.

As shown on Table 3-1, it is anticipated that the borings completed in the overburden soil will be advanced to varying depths (maximum of 70 feet bgs) to delineate the vertical extent of MGP residuals previously observed at depths up to 67 feet bgs in soil at the site. However, as stated in the footnotes of Table 3-1, completion depths may be adjusted shallower in instances where 10 feet of clean soils are encountered below apparently contaminated soils. Likewise, if impacts are noted at the proposed termination depth in any boring, National

Grid will consult with NYSDEC to determine the appropriate course of action, with a goal of obtaining vertical delineation in this RI mobilization.

Based on previous investigation methods, the subsurface borings will be advanced by either rotosonic drilling methods equipped with 4-inch diameter sampling cores or hollow-stem augers (HSAs) equipped with 2-inch or 3-inch diameter split-spoon samplers. In some instances, a direct-push (Geoprobe™) drilling rig equipped with Macro-Core™ samplers may be used if there are access limitations. Each of the methods will allow for continuous soil samples to be taken from the ground surface to the bottom of the borehole for both field characterization (photoionization detector screening and observations) and for the collection of samples for the chemical analyses.

The soil samples obtained by either method will be logged by a geologist recording such data as the presence of fill material or subsurface structures, the nature of each geologic unit encountered, observations regarding moisture content, the results of PID readings, and visual and olfactory observations regarding the presence of hydrocarbon-like residuals. The soils will be logged in accordance with the National Grid protocols (KeySpan, 2005) detailed in the FSAP (Appendix C).

Three soil samples are proposed for laboratory analysis from each soil boring. The first sample will be collected at the depth of greatest apparent contamination from the 0 to 5 feet bgs interval. The sample will be collected beneath the pavement and road base (or other surface cover) during utility clearance activities performed prior to borehole advancement. The second soil sample for laboratory analysis, will be collected from the apparently most impacted interval, below 5 feet bgs, based on PID screening and field observations. If impacts are not encountered, the sample will be collected from the 1-foot interval immediately above the water table. The third sample will be collected at the first clean interval below impacts (if encountered) or the bottom of the boring to confirm “non-impacted” conditions. As outlined on Table 3-1, the majority of the subsurface soil samples will be analyzed for VOCs using USEPA Method 8260B, SVOCs using USEPA Method 8270C, RCRA 8 metals using USEPA Methods 6010 and 7000-series, and free cyanide (extraction by EPA method 9013A and analysis by Microdiffusion, ASTM International method D4282-02). A subset (20%) of the initial sample locations (Table 3-1) will be analyzed for the full Target Compound List (TCL) VOCs, SVOCs, pesticides (USEPA Method 8081A), herbicides (USEPA Method 8151A), PCBs (as aroclors; USEPA Method 8082), Target Analyte List (TAL) metals, and free cyanide ASTM International method D4282-02. The frequency of these additional analyses will be reviewed for subsequent samples.

Samples of grossly impacted soil containing visible tar-like or oil-like NAPL will generally not be sampled for laboratory analyses. These “MGP source” materials will be assumed to be impacted to the extent that management will be required by the NYSDEC. Information regarding the vertical extent of this material will be recorded on the boring logs by the field geologist and the areal extent of this material will be surveyed during the survey task. However, in some instances, e.g. locations adjacent to the site perimeter, samples may be collected for forensic analysis to better evaluate the potential source of the impacts.

Overburden monitoring wells will be installed in nine of the proposed RI soil borings. The monitoring well locations, shown on Figure 3-1, were selected to have a sufficient number of wells (along with the previously installed recovery wells) to evaluate groundwater in areas that are considered up gradient, crossgradient, and downgradient of the site. In general, the groundwater monitoring wells will be installed at two depth intervals: the water table (estimated to be screened from 5 to 15 feet bgs) so that the screen straddles the water table above the “meadow mat” layer; and from approximately 30-40 feet bgs in the intermediate portion of the glacial outwash aquifer underlying the meadow mat layer allowing the screen to straddle the most impacted soil layer (if present). This deeper interval will be most consistent with the screened intervals of the recovery wells installed by FC Gowanus, LLC at the current Lowe’s property.

In addition, four deep wells (estimated to be screened from approximately 60 to 70 feet bgs) are also proposed to provide good lateral coverage to evaluate deeper portions of the glacial aquifer at depths consistent with the maximum extent of impacts noted in previous investigations at the site near former Holders 1 through 3.

Actual well design will depend on site conditions encountered, such as thickness of the saturated zone, observed stratigraphy, and the presence, location, and thickness of NAPL, if any.

The wells will be constructed using a 2-inch diameter Schedule 40 PVC well riser with a 0.01 or 0.02-inch slotted screen (if NAPL present), and a 2-foot long sump for monitoring the presence of any denser than water non-aqueous phase liquid (DNAPL). Grout will be tremied into the borehole annulus above the sand pack and the bentonite seal to seal the borehole to grade (given the lack of significant confining units at the site, it is not envisioned that isolation casing would be beneficial in preserving well integrity). National Grid may also evaluate the use of commercial nested wells for the well triplet locations in areas where no visible impacts or NAPL are detected. Additional details for monitoring well installation are provided in the FSAP.

Additionally, AECOM will conduct an on-site meeting with National Grid and the NYSDEC during the later stages of field activities to review observations/findings and discuss the need and potential benefits of collecting additional data/samples to further the understanding of site conditions, or potentially complete the delineation of impacts. A review of the status of the program at this time provides the ability to improve the efficiency of the program and minimize the need for subsequent mobilizations of staff and equipment.

3.5 Well development

Each of the new monitoring wells will be developed not sooner than 24 hours after their installation to evacuate fine-grained sediments that may have accumulated within the well during installation. Well development methods are presented in the FSAP.

3.6 Groundwater sampling and aquifer conductivity testing

Following completion of the well development, the wells will be allowed to stabilize for at least two weeks, and then sampled. All new and selected existing wells, including perimeter locations, will be checked for the presence of light non-aqueous phase liquids (LNAPL) or dense non-aqueous phase liquid (DNAPL). Water levels will be measured in all the new and select existing wells, and a groundwater flow direction map will be prepared and included in the RI Report for each of the three aquifer depth zones. Groundwater samples will be collected from all newly installed wells using low-flow purging methods using either a peristaltic pump or submersible pump with the downhole tubing or the pump placed at the approximate midpoint of the screened interval. At the ground surface, the water will pass through a sealed chamber containing probes which will measure the water temperature, pH, specific conductivity, oxidation-reduction potential, and dissolved oxygen. Samples of water discharging from the chamber will be collected at regular intervals and analyzed for turbidity using a hand-held field meter. After passing through this chamber, the water will be discharged to a calibrated five-gallon bucket where the pumping rate will be calculated. When this bucket is full, the water will be transferred into a fifty-five gallon drum where it will be stored for future disposal. Pumping rates will be set below the maximum sustainable flow rate so as not to significantly lower the water level in the well.

Groundwater analytical samples will be collected when water quality parameters have stabilized. Table 3-1 provides summary information for the groundwater samples to be collected including the sample designations, sample rationale, and the laboratory analyses to be completed. The majority of the groundwater samples will be analyzed for VOCs using USEPA Method 8260B, SVOCs using USEPA Method 8270C, RCRA 8 metals using USEPA Methods 6010 and 7000-series, and total cyanide using USEPA Method 9012. A subset (20%) of the initial sample locations (Table 3-1) will be analyzed for the full Target Compound List (TCL) VOCs, SVOCs, pesticides (USEPA Method 8081A), herbicides (USEPA Method 8151A), PCBs (as Aroclors; USEPA Method 8082), Target Analyte List (TAL) metals, and total cyanide (USEPA Method 9012). The frequency of these additional analyses will be reviewed for subsequent samples.

Following groundwater sampling (and assuming that soil conditions are conductive, i.e. they do not recover too rapidly), conductivity tests (slug tests) will be performed at three well locations providing good lateral and vertical coverage at the Site. These data will be used to calculate the hydraulic conductivity of the aquifer to support the evaluation of the fate and transport of Site impacts and potential remedial alternatives.

Prior to any slug testing, “trial” slug tests will be performed to evaluate probable groundwater recovery characteristics at the wells. During aquifer testing, a background continuous water level survey (at least 24 hours) may be performed at select wells to evaluate the extent of tidal influence documented in previous investigation reports. If the pre-screening evaluations show that slug tests are a viable method to evaluate aquifer conductivity at the site, the slug tests will be performed by slug removal (water table wells only) or pneumatic testing methods and timing the equilibration to the static water level. The general steps to be performed during pneumatic slug testing are as follows:

- Static water level will be measured to the nearest 0.01 foot.
- A pressure transducer, attached to a data logger, will be placed into the well and the water level allowed to equilibrate to static conditions.
- The water column in the well will be pressurized while simultaneously measuring and recording water levels with the pressure transducer and data logger until the water level has equilibrated (“falling head test”).
- The pressure in the well will then be rapidly removed and the water level will be measured and recorded (“rising head test”).

The data from these tests will be analyzed by AQTESOLV[®] according to the Bouwer and Rice method (1989) or equivalent methods to calculate average hydraulic conductivity values for the aquifer.

3.7 Sub-slab vapor/indoor air/ambient air sampling

A soil vapor intrusion survey will be performed at the Site since MGP-related compounds have been detected in soil vapor, soil, and groundwater samples collected from the Site. The work will be performed in accordance with Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, 2006) and the USEPA document entitled *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils, Office of Solid Waste and Emergency Response* [US EPA, 2002]. The sampling event will be conducted in a one-time event during the heating season between November 1 and March 31 and will require two days to complete. The proposed sampling plan consists of the collection of a total of 10 samples, with two sub-slab vapor samples and matching indoor air samples collected in each of two buildings (eight total) plus one ambient outdoor air sample and one sample duplicate. The approximate sampling locations are shown on the Figure 3-1. Rationale for their placement is included on Table 3-1.

The indoor/ambient air and sub-slab vapor sampling will require two days to complete. On the first day, a chemical inventory check will be performed within each of the two site buildings to document current conditions with the regard to the storage of chemicals at each facility. On the second day, the ambient air sample, indoor air samples and sub-slab vapor samples will be collected concurrently.

Following utility clearance processes, sub-slab soil vapor samples will be collected from immediately below the concrete floor slabs of each building. The soil vapor samples will be collected from the immediately below the floor slab in accordance with NYSDEC Guidance. The sub-slab sampling implants will be installed by drilling a 3/4-inch diameter hole through the concrete slab and placing Teflon tubing in the hole. An air-tight seal will be created by filling the space between the tubing and the concrete with hydrated bentonite clay or modeling clay. The integrity of the seals around the implants will be confirmed by placing a helium-filled “shroud” around the insertion points. One to three volumes of air will be purged with a helium meter at a rate not to exceed 0.2 liters per minute. Detections of helium will indicate a leak in the seal, requiring that the seal be repaired or replaced.

The sample tubing will be attached to the sample container (6-liter Summa canister) with Swagelok[™] fittings. All samples will be collected in batch certified clean canisters through regulators set for an eight-hour sample duration, which conforms to the NYSDOH Guidance. Following the sub-slab vapor sample collection, all

concrete coring holes will be sealed and patched to match the existing grade. Additional information regarding the methods to be used for the soil vapor sampling is presented in the FSAP.

Indoor air samples will be collected at the same location as the sub-slab samples. All samples will be collected in batch certified, 6-liter Summa canisters through regulators set for an eight-hour sample duration, consistent with the soil vapor samples. The ambient air sample will be collected at a location determined to be upwind of the buildings at time of sampling. The air and soil gas samples will be shipped overnight to a NY ELAP-certified laboratory (Air Toxics, Ltd.) for analysis.

The laboratory samples will be analyzed for VOCs (including naphthalene) by USEPA SW846 Method TO-15, with an extended analyte list. The minimum reporting limit for the analysis will be at most one part per billion (1 to 7 micrograms per cubic meter depending on the molecular weight for each compound). The helium analysis will be performed using modified method ASTM D1945. The laboratory turn-around-time will be 14 days from the date the samples are received by the laboratory. The analytical results will be provided by the laboratory in a summary table, which will also include NYSDOH background concentrations for the respective target compounds.

The results of the indoor air and ambient air results will be evaluated by first comparing the VOC concentrations to typical background values published by NYSDOH. If compounds are detected above the typical range, the data will be evaluated to determine the sources of these compounds. For example, benzene may be associated with MGP residuals but is also widely found in urban soil gas and indoor air due to gasoline. To distinguish between these sources, and prevent the false attribution of the benzene to MGP residuals, compound ratios and the presence or absence of indicator compounds will be examined. In addition to the standard TO-15 list of compounds, several additional compounds will be analyzed for, including: indane, indene, thiophene, 2-methyl pentane, isopentane, 2,3-dimethyl pentane, isooctane, and methyl tert butyl ether (MTBE). This list of additional compounds was developed specifically for use in evaluation of soil vapor intrusion at MGP sites. Indane, indene, and thiophene are usually associated with MGP residuals. The presence or absence of these indicator compounds will be used as a line of evidence to distinguish between MGP and non-MGP sources in the soil vapor and indoor air. Similarly, inclusion of the pentane compounds and MTBE will allow the presence of gasoline sources to be identified. In some cases, statistical analysis of the data may be used to distinguish among the sources.

3.8 Site survey

A survey of the investigation sampling points and important site features (buildings, streets, etc.) will be conducted at the end of the fieldwork by a licensed NY-State surveying contractor. All horizontal locations will be reported in the New York State Plane Coordinate System, Long Island Zone (NAD83) in feet. All vertical measurements will be reported in NAVD88 in feet, to the nearest 0.1 ft. and 0.01 ft. for soil borings and monitoring wells respectively.

3.9 Investigation-derived waste management

All investigation waste generated during the RI will be collected in properly labeled USDOT approved storage containers (55-gallon drums) or a small bulk roll-off container and grouped by environmental matrix (soil, water, PPE/plastic, construction debris). If drums are used, as they are filled they will be tracked and given unique identification codes based on the following:

- A prefix indicating the site where the drum was generated and the drum's contents: i.e., M – Metropolitan plus S – Soil, W – Water, P – PPE/Plastic, and C&D – Construction Debris.
- Following the prefix and a hyphen will be the drum's chronological number of generation. For example, drum MS-1 is the first drum of the project generated and is filled with soil. Drum MW-8 is the eighth drum generated and contains water.

- As drums are generated, their identification code, date of generation, contents, source (i.e., drill cuttings from location x, purge water from well y), and date sampled will be entered on a tracking table.

The drums (or roll-off container) will be stored at a locked, temporary fenced location to be decided during the kickoff meeting, which will be completed prior to the start of the field investigation. Subsequently, the waste soils will be characterized with laboratory analyses including full TCLP, corrosivity, ignitability, reactivity, TPH, and PCBs. Waste transportation and disposal of all contaminated wastes will be managed by National Grid.

3.10 Analytical program summary

The laboratory samples for each media and the chemical analyses to be performed are included in Table 3-1. Requisite quality assurance/quality control (QA/QC) samples are presented in the QAPP (Appendix D).

3.10.1 Surface and subsurface soil analyses

The majority of the soil samples will be analyzed for the following parameters:

- VOC compounds by USEPA Method 8260B;
- Semi-volatile organic compounds (SVOCs) by USEPA Method 8270C;
- RCRA 8 metals by USEPA Method 6000-7000 Series; and
- Free Cyanide (extraction by EPA method 9013A and analysis by Microdiffusion, ASTM International method D4282-02).

A subset (approximately 20%) of the total number of soil samples will be analyzed for an expanded list of the following parameters:

- Full TCL VOCs by USEPA Method 8260B;
- Full TCL SVOCs by USEPA Method 8270C;
- TAL Metals by USEPA Method 6000-7000 Series;
- TCL Pesticides by USEPA Method 8081A;
- TCL Herbicides by USEPA Method 8151A;
- PCBs (as Aroclors) by USEPA Method 8082; and
- Free Cyanide (extraction by EPA method 9013A and analysis by Microdiffusion, ASTM International method D4282-02)

3.10.2 Groundwater analyses

Similar to soils, the majority of groundwater samples will be analyzed for the following parameters:

- VOC compounds by USEPA Method 8260B;
- SVOC compounds by USEPA Method 8270C;
- TAL Metals by USEPA Method 6000-7000 Series; and
- Total Cyanide by USEPA Method 9012.

A subset (approximately 20%) of the total number of groundwater samples will be analyzed for an expanded list of the following parameters:

- Full TCL VOCs by USEPA Method 8260B;
- Full TCL SVOCs by USEPA Method 8270C;
- TAL Metals by USEPA Method 6000-7000 Series;
- TCL Pesticides by USEPA Method 8081A;
- TCL Herbicides by USEPA Method 8151A;
- PCBs (as Aroclors) by USEPA Method 8082; and
- Total Cyanide by USEPA Method 9012.

3.10.3 Soil vapor/indoor air/ambient air analyses

The soil vapor/indoor air/ambient air samples will be analyzed for VOCs by USEPA Method TO-15 (including naphthalene). The soil vapor samples will also be analyzed for helium by ASTM Method ASTM D-1945. In addition to the standard TO-15 list of compounds, several additional compounds will be analyzed for, including: indane, indene, thiophene, styrene, 2-methyl pentane, isopentane, 2,3-dimethyl pentane, isooctane, and MTBE.

3.10.4 Waste characterization/profiling

Sufficient samples (a minimum of two) will be collected during the investigation and analyzed for full RCRA Hazardous Characteristics testing to determine if materials exhibiting hazardous characteristics may be present at the site and to support waste disposal profiling purposes. The analyses to be performed may include, but not be limited to, the following, depending on the medium and the selected disposal facility:

- Total Metals by USEPA Method 6010B (Mercury 7470A);
- Total Petroleum Hydrocarbons (DRO and GRO) by USEPA Method 8015 modified;
- PCBs by USEPA 8020;
- TCLP ZHE Extraction – U.S. EPA Method 1311;
- TCLP VOC – USEPA Method 8260B;
- TCLP SVOC – USEPA Method 8270C;
- TCLP RCRA Metals – USEPA Method 6010B (Mercury 7470A);
- Corrosivity – USEPA Method 9045C;
- Ignitability/Flashpoint – USEPA SW-846 Method 1010A
- Reactive Cyanide and Reactive Sulfide by USEPA SW-846 Chapter 7, Sections 7.3.3.2/7.3.4.2; and
- Total Organic Halogens – USEPA SW-846 Method 9020B

3.10.5 Quality assurance/quality control sampling

Field and laboratory quality control samples for the investigation will be collected and analyzed to document the accuracy and precision of the samples. The QA/QC samples, summarized in the QAPP (Appendix D), include trip blanks, field equipment blanks, field duplicates and matrix spikes, and matrix spike duplicates. The data quality level for the investigation will be consistent with procedures outlined in the NYSDEC Analytical Services Protocol (ASP) July 2005 methodologies. A full ASP Category B data package will be prepared by the laboratory for all samples. The data will be reviewed, and a Data Usability Summary Report (DUSR) will be prepared by a qualified chemist. Additional QA/QC information is provided in the QAPP.

3.11 Fish and wildlife resource impact assessment

A fish and wildlife resource impact assessment (FWRIA) has been conducted as part of the Gowanus Canal Investigation performed for National Grid by GEI and summarized in report dated April 2007 (Appendix G). In summary, there does not appear to be a significant risk as a result of the former MGP. Due to rapid sedimentation in the canal from the numerous combined sewer overflows (CSOs), the upper three feet of sediment has been isotopically dated to post-date the operation of the former MGP. Therefore, any inputs to the canal from the former MGP have been buried beneath this rapidly accumulating CSO sediment/sewage beneath the biologically active zone. A complete copy of the FWRIA will be included in the RI report.

4.0 Additional work plan documents

Four companion documents have been prepared to detail the methods and procedures to be used during the RI. Each of the documents is included as an Appendix to this Work Plan.

4.1 Field sampling and analytical plan

All sampling and analyses will be conducted in accordance with the methods described in the site-specific FSAP. The FSAP provides a description of the objectives and methods for each of the investigation field activities, and details concerning the project organization. The FSAP is provided in Appendix C.

4.2 Quality assurance project plan

In addition to the FSAP, a full QAPP has been developed for use on this project. The QAPP identifies the quality assurance objectives for the measurement data, the QA/QC procedures to be used in the field, the sample chain-of-custody methods to be used, and the analytical procedures to be followed. The QAPP will also include a description of the manner in which each type of data is to be used. The QAPP is provided in Appendix D.

4.3 Community air monitoring plan

A CAMP has been developed for this project that will be followed during all invasive fieldwork (soil borings, borings for well installations, and test pitting). Included in the CAMP is a description of methods that may be used to control odors during the RI if needed. The CAMP is provided in Appendix E.

4.4 Site-specific health and safety plan

A site specific HASP has been prepared to outline health and safety risks and procedures for all site workers and visitors. Included in the HASP is information regarding physical and chemical hazards at the site, emergency procedures and contact information, incident reporting procedures, and the route to the hospital. The HASP is provided in Appendix F.

5.0 Qualitative Human Health Exposure Assessment

A Qualitative Human Health Exposure Assessment (QHHEA) will be conducted following New York Department of Environmental Conservation (NYSDEC) guidance (Appendix 3B of NYSDEC, 2002). The QHHEA will characterize the exposure setting, identify potentially complete exposure pathways, and qualitatively evaluate potential fate and transport of constituents from one medium to another (i.e., soil-to-air or soil-to-groundwater).

An exposure pathway is considered complete when the following five conditions are met:

1. Source (i.e., MGP residuals);
2. Release and transport mechanism from source to environmental media (i.e., leaching of MGP residuals into the subsurface or volatilization to the air of an overlying building);
3. Point of human exposure (i.e., an occupied building or surface soil);
4. A route of exposure (ingestion, dermal contact, or inhalation);
5. A receptor population (i.e., on-site workers).

Once potentially complete exposure pathways are identified, the QHHEA will characterize site conditions to determine whether the site poses an existing or potential future hazard to the potentially exposed population. The evaluation will include a qualitative discussion of potential fate and transport mechanisms at the site. The results of the QHHEA will be included as part of the RI Report.

6.0 Project schedule and deliverables

6.1 Schedule

The RI field work will be initiated following approval of the scope of work presented in this Work Plan by NYSDEC. A general timeline for the project includes the following milestones:

- Field Mobilization – within 45 days of the approval of the work plan.
- Duration of Currently Proposed Field Activities – approximately 45 days.
- Draft Report to National Grid – within 60 days of the completion of field activities.
- Final Report to NYSDEC – within 90 days of the completion of field activities.

The milestones presented above are subject to change based on delays caused by access limitations and/or weather and unforeseen circumstances. However, it is intended to maintain a schedule to complete the project as expeditiously as possible. A more specific schedule will be submitted upon approval of the Work Plan.

6.2 Deliverables

6.2.1 RI Report

Upon completion of the field activities, an RI Report will be prepared to document the findings of the investigations performed at the site. The report will be consistent with the specifications presented in the Draft DER-10 (NYSDEC, 2002) document and will include:

- An executive summary
- A site description and history
- Summary information regarding previous investigations and remedial work performed at the site
- Descriptions of all field activities performed
- A summary of all field observations, field measurements, and laboratory analytical data summarized in tabular format. Data will be managed in a database. Soil and groundwater analytical results will be compared to appropriate NYSDEC guidance and standards. The results of the indoor air and ambient air results will be evaluated by first comparing the VOC concentrations to typical background values published by NYSDOH
- Plan view and cross-section figures presenting laboratory analytical data and field observations of surface and subsurface soil and groundwater impacts. A minimum of two profiles will be developed, one perpendicular to and one parallel with groundwater flow direction at the Site
- A qualitative human health risk assessment which assesses the sources of impact, on and off-site human and ecological receptors, and exposure pathways
- A summary of FWRIA findings based on previous Gowanus Canal investigation work
- An integration of field observations and measurements with laboratory analytical data to evaluate the nature and extent of impacts and to develop a site conceptual model of potential contaminant migration
- A set of conclusions for the investigation
- Recommendations

Appendices to the report will include all pertinent data used to support the RI effort, including validated laboratory analytical results (Form 1s), data usability reports, stratigraphic boring and monitoring well construction logs, and all field sampling sheets (monitoring well development forms, aquifer testing results, groundwater sampling sheets, etc.).

The RI Report will be reviewed and approved by a qualified senior geologist. The report and site data will be prepared and organized such that it can be used for the preparation of a feasibility study for the site. If appropriate, recommendations for additional site activities will be provided.

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Tables

Table 2-1
Adjacent Property Details
Metropolitan Former MGP
124 - 136 Second Avenue, Brooklyn, NY

Property	Database	Description	Source
Eastern Abutters across 2nd Ave			
NYCDS (127 2nd Ave)	HIST UST	7 closed-in-place USTs in Dec 2000 of unleaded gas, diesel, kerosene, and unknown contents. Also 5 in-service USTs. One 6000-gal Used oil, 4,000-gal diesel, 550-gal used oil, and 2 2000-gal unknown content USTs.	EDR Report
NYCDS (127 2nd Ave)	HIST AST	Two 275-gal unknown content ASTs were closed in 1993.	EDR Report
NYCDS (127 2nd Ave)	NY Spill	9-27-00 - #2 heating oil leak. Soil and GW contamination limited to area along 2nd Ave. VOC contaminants and a system was installed at the site which was shut down on July 2006. Soil sampling performed Jun/July 2007 and elevated VOC results. Last report mentioned was a progress report submitted June 2008. No Closure	EDR Report
NYCDS (127 2nd Ave)	Manifests	1993 and 2008 - for non-listed ignitable wastes	EDR Report
NYCDS (127 2nd Ave)	RCRA - NonGen	no violations found.	EDR Report
NYCDS (127 2nd Ave)	NY Spill	12-14-94 - Petroleum - vent pipe overflowed - closure date 10-30-03.	EDR Report
NYCDS (127 2nd Ave)	NY Spill	12-6-93 - This relates to above spill that had the remediation system. This entry describes correspondence regarding extraction wells and sampling frequency. The end of the entry matched the one above.	EDR Report
NYCDS (127 2nd Ave)	LTANK	2-22-01 - tank test failure of #2 fuel oil. Memo says to uncover and inspect, no other update -	
11th St. and 2nd Ave	NY Spill	9-11-02 - Clean up unknown material on vacant lot - once was US postal facility and MGP site. It is no listed what the "material" was.	EDR Report
MH 52966 - 2nd Ave. and 10th St.	NY Spill	2-2-05 - Approx 1 quart of unknown oil found in 50 gals of water at manhole. Structure was double washed and spill closed 7-22-05.	EDR Report
2nd and 10th St.	NY Spill	7-7-94 - unknown petroleum spill of 10 gal. Memo states NYC DEP cleaned up site - no other info - spill closed 7-7-94.	EDR Report
2nd and 10th St. (construction site)	NY Spill	6-19-03 - caller stated that there was oil coming out of the ground at the construction site. Spill closure date 6-25-03. Not other info about corrective action	EDR Report
10th St. substation	NY Spill	8-19-1999 - transformer failed from unknown cause and material spilled to soil. Spill was contained to 100 gals. Closure date of 11-9-04.	EDR Report
137 Gowanus Refuse facility	RCRA - NonGen	no violations found.	EDR Report
Across Second Street	1996-1904	No Sanborn coverage	Sanborn
Across Second Street	1886	unlabeled store buildings	Sanborn
Across Second Street	2006, 1994	Buildings encompass entire abutters	Aerial
Across Second Street	1984, 1975, 1966, 1953, and 1943	Buildings encompass most of abutting properties beyond 2nd street, and one parking area	Aerial

Table 2-1
Adjacent Property Details
Metropolitan Former MGP
124 - 136 Second Avenue, Brooklyn, NY

Property	Database	Description	Source
Southeastern Abutter (on Block 1025)			
SE of NYC PS Office Building	1996, 1995, 1993	Unlabeled lots	Sanborn
SE of NYC PS Office Building	1992, 1991, 1988	"Sanitation Chemicals" to the south-southeast before 2nd Ave	Sanborn
SE of NYC PS Office Building	1987, 1986, 1982, 1981, 1980, 1979	"Sanitation Chemicals" to the south-southeast - Auto Salvage yard to the east-southeast	Sanborn
SE of NYC PS Office Building	1977, 1969, 1950	"Sanitation Chemicals" to the south-southeast - dwellings present 1950 to east-southeast	Sanborn
SE of NYC PS Office Building	1938	furniture warehouse to south-southeast - trucking property to east-southeast	Sanborn
SE of NYC PS Office Building	1915	unlabeled buildings and dwellings	Sanborn
SE of NYC PS Office Building	1904	Carpet Cleaning business and dwellings	Sanborn
SE of NYC PS Office Building	1886	Stone cutting yard and dwellings	Sanborn
SE of NYC PS Office Building	2006, 1994, 1984	Parking area and one smaller building	Aerial
SE of NYC PS Office Building	1975, 1966	Parking area and two smaller buildings	Aerial
SE of NYC PS Office Building	1954	Four buildings	Aerial
SE of NYC PS Office Building	1943	Three buildings	Aerial
Northeastern Abutter (across 11th)			
Vault at 58-74 10th Street	NY Spill	12/12/2000 Approx. 6-gals of soil on 800-gals of water in vault. Sample had PCB hits, vault was drained and pressure washed. Case closed 4-19-01.	EDR Report
Lowes - 118 2nd Ave	UST and HIST UST	7 USTs closed-removed between May 1993 and April 1994. (3 5,000-gal Diesel (93), 1 5,000-gal unleaded gasoline (93) and 3 20,000-gal Fuel oil (94).) One AST of unlisted content was closed in June 1999. There is one AST showing as in-service with no listing of content or size.	EDR Report
Across 11th Street	1996-1904	No Sanborn Coverage	Sanborn
Across 11th Street	1886	undeveloped	Sanborn
Block 1007, lots 1 and 118	2006	Connecting building to subject site building on Lot 220 and parking on lot 1	Aerial
Block 1007, lots 1 and 118	1994	One large building on lot 118 and clear area on lot 1	Aerial
Block 1007, lots 1 and 118	1984, 1975, 1966, 1953	One large building on lot 118 and two structures located at the SE side of Lot 1 parking area to the north of Lot 1	Aerial
Block 1007, lots 1 and 118	1943	One building at the eastern side of Lot 118 and rest of lot 118 and Lot 1 are cleared	Aerial

Table 2-1
Adjacent Property Details
Metropolitan Former MGP
124 - 136 Second Avenue, Brooklyn, NY

Property	Database	Description	Source
Northern western Abutter			
	1996-1886	Gowanus Canal	Sanborn
	2006 - 1943	Canal	Aerial
Southern western Abutter close to Gowanus Expressway			
Bruno Truck Sales (435 Hamilton Ave)	RCRA-CESQG	No violations found.	EDR Report
Bruno Truck Sales (435 Hamilton Ave)	Manifests	1998, 1999 - Non-listed ignitable wastes	
Bruno Truck Sales (435 Hamilton Ave)	UST	3 1,000-gal USTs of unknown content, 1 4,00-gal Unleaded gas, 1 4,000-gal diesel USTs in service. Not on LTANK list	Sanborn
Southern abutter of parking area	1996, 1995, 1993, 1992, 1991, 1988,	unlabeled building	Sanborn
Southern abutter of parking area	1982, 1981, 1980, 1979, 1977	Vacant	Sanborn
Southern abutter of parking area	1969, 1950	Machine Shop and manufacturing Chemists	Sanborn
Southern abutter of parking area	1938	Paint and varnish warehouse, pipe storage and a Brooklyn Alcatraz Asphalt building	Sanborn
Southern abutter of parking area	1915	Brooklyn Alcatraz Asphalt building and two vacant buildings containing boilers and terminal ornamental Iron Works	Sanborn
Southern abutter of parking area	1904, 1886	Saw and planing mill building and F.J.W. Bursch Co Salt building	Sanborn
Southern abutter of parking area	2006, 1994, 1984	Building, appears to be a shipping/receiving building	Aerial
Southern abutter of parking area	1975, 1966, 1953, 1943	Three smaller buildings	Aerial
Southern western Abutter Block 1025 Lot 52			
Block 1025, Lot 52	1996, 1995, 1993, 1992, 1991, 1988,	Unlabeled 2 story building	Sanborn
Block 1025, Lot 52	1950	Andro Waste Material Inc. - cotton waste - picking and cleaning - paper storage and bailing	Sanborn
Block 1025, Lot 52	1938	Cooperage Work - storage yard	Sanborn
Block 1025, Lot 52	1915	Cooperage and Purcell Bros' Cut Stone Works	Sanborn
Block 1025, Lot 52	1904, 1886	Undeveloped	Sanborn
Block 1025, Lot 52	2006, 1994	Parking area	Aerial
Block 1025, Lot 52	1984, 1975, 1966, 1953, 1943	"L" shaped building at the NE and NW side of the lot with parking	Aerial

Table 2-1
Adjacent Property Details
Metropolitan Former MGP
124 - 136 Second Avenue, Brooklyn, NY

Property	Database	Description	Source
Southern western Abutter across from Block 1025, lot 100			
Block 1031, Lot 1	1996, 1995, 1993, 1992, 1991, 1988,	Truck Sales and Service building	Sanborn
Block 1031, Lot 1	1981, 1980, 1979, 1977	Vacant	Sanborn
Block 1031, Lot 1	1969, 1950, 1938	Machine Shop and welding buildings with Gas Tanks	Sanborn
Block 1031, Lot 1	1915	Vacant	Sanborn
Block 1031, Lot 1	1904	Roebuck window screens Co with finishing Machine Paint Shop - and a generic storage and shipping building	Sanborn
Block 1031, Lot 1	1886	Lumber yard	Sanborn
Block 1031, Lot 1	2006, 1994, 1984	One building encompasses Lot	Aerial
Block 1031, Lot 1	1975, 1966, 1953, 1943	Several smaller buildings with parking areas	Aerial
Southern Abutter			
NYC Sanitation (465 Hamilton Ave)	RCRA-Non Gen	No violations found.	EDR Report

Table 2-2
Historical Information Summary
Metropolitan Former MGP
124 – 136 Second Avenue, Brooklyn, NY

Year(s)	Comments
1896	The area of the subject property southwest of 11 th Street was occupied by the Metropolitan Gas Light Company (used for storage only). A coal shed, gasometer and retorts existed on the subject property. The area northeast of 11 th Street, between 10 th Street was vacant.
1904	The area of the subject property southwest of 11 th Street was in use as a manufactured gas plant, Brooklyn Union Gas Company. Iron oil and fuel oil tanks exist on the property. The manufactured gas plant appears to have operated as a coal gas plant. A coal shed, gasometers (3), gas purifying facilities and retorts existed on the subject property.
1915	The area of the subject property southwest of 11 th Street was still in use as a manufactured gas plant, Brooklyn Union Gas Company. The Brooklyn Union Gas Company has expanded to the southwest of the subject property. It appears the plant has converted to a carbonated water process due to the increased number of oil storage tanks. One iron oil and the fuel oil tank have been removed. One iron oil tank is now listed as a iron tar tank. An asphalt plant was located on two parcels and included a vehicle maintenance facility with 150 gallon and 250 gallon underground gasoline storage tanks.
1938	The area of the subject property southwest of 11 th Street was still in use by Brooklyn Union Gas Company (listed as 12 th Street Holder Dept.). The maps show several changes in the plant process or layout. The oil storage tanks, manufactured gas holding tanks, and all equipment have been removed. A hydrogen holder is listed as "To Be Coal Bunker." An underground gasoline tank appears in the vicinity of the future coal bunker. The asphalt plant is no longer in operation.
1950	The area of the subject property southwest of 11 th Street has been subdivided. The northwest portion is still listed as Brooklyn Union Gas Company. A former hydrogen holder is listed as a coal bunker. The southeastern portion is listed as the U.S. Post Office Department (lessee) garage and repair shops identified as the vehicle maintenance facility (VMF). Two locations of UST gasoline tanks were presented in the U.S. Post Office Building. The area of the subject property northeast of 11 th Street has not significantly changed since 1938.
1977	The existing detached mail unit (DMU) appears on the subject property northeast of 11 th Street. UST gasoline tanks were listed at the northwestern end of the subject property. The area of the subject property southwest of 11 th Street no longer is occupied by the Brooklyn Union Gas Company. The UST gas tank which was located near the coal bunker is not shown.
1981 –1996	The area of the subject property northeast of 11 th Street and southwest of subject property has not significantly changed.

Note:

Information extracted from the Nelson, Pope & Voorhis, LLC. Phase I Environmental Site Assessment Report dated May 15, 1997.

Table 2-3
Historic Laboratory Sample Summary - Soils
Metropolitan Former MGP
124 - 136 Second Avenue, Brooklyn, NY

Location Type	Location ID	Sample Depth (ft bgs)	Boring Log Available	Total Boring Depth (ft bgs)	Excavation Depth (ft bgs)	SOIL										Comments	Source
						VOC	SVOC	PAH	METALS	CYANIDE	TCLP METALS	H2S RELEASED FROM WASTE	LEACHABLE AMENABLE CYANIDE	LEACHABLE TOC	DRO/GRO		
Monitoring Well	SP-1/GWP-1	4 - 8			15	X	X		X	X							Nelson, Pope and Voorhis, June 1997
Monitoring Well	SP-2/GWP-2	4 - 8			11	X	X		X	X							Nelson, Pope and Voorhis, June 1997
Monitoring Well	SP-3/GWP-3	4 - 8				X	X		X	X							Nelson, Pope and Voorhis, June 1997
Monitoring Well	SP-4/GWP-4	4 - 8				X	X		X	X							Nelson, Pope and Voorhis, June 1997
Monitoring Well	SP-5/GWP-5	4 - 8			22	X	X		X	X							Nelson, Pope and Voorhis, June 1997
Monitoring Well	SP-6/GWP-6	4 - 8				X	X		X	X							Nelson, Pope and Voorhis, June 1997
Boring	SP-7	3 - 8	Yes	7	16										X	Note total depth and sample depth does not match.	Nelson, Pope and Voorhis, June 1997
Boring	SP-10	4 - 10	Yes	7.5		X	X		X	X							Nelson, Pope and Voorhis, June 1997
Boring	SP-11	4 - 10	Yes	10		X	X		X	X							Nelson, Pope and Voorhis, June 1997
Boring	SP-12	5 - 11	Yes	10		X	X									Note total depth and sample depth does not match.	Nelson, Pope and Voorhis, June 1997
Boring	SP-13	5 - 11	Yes	10		X	X									Note total depth and sample depth does not match.	Nelson, Pope and Voorhis, June 1997
Boring	SP-14	4 - 8				X											Nelson, Pope and Voorhis, June 1997
Boring	SP-15	4 - 8				X											Nelson, Pope and Voorhis, June 1997
Boring	DP-2	6 - 8	Yes	28		X	X					X	X				ARKF, Jan. 2001
	DP-2	20 - 24	Yes	28		X	X					X	X				ARKF, Jan. 2001
Boring	DP-4	4 - 6	Yes	18	8	X	X					X	X				ARKF, Jan. 2001
	DP-4	16 - 18	Yes	18	8	X	X					X	X				ARKF, Jan. 2001
Boring	DP-6	8 - 10	Yes	18	22	X	X					X	X				ARKF, Jan. 2001
	DP-6	16 - 18	Yes	18	22	X	X					X	X				ARKF, Jan. 2001
Boring	DP-7	12 - 14	Yes	18	24	X	X					X	X				ARKF, Jan. 2001
	DP-7	16 - 18	Yes	18	24	X	X					X	X				ARKF, Jan. 2001
Boring	DP-10	15 - 16	Yes	28	8	X	X					X	X				ARKF, Jan. 2001
	DP-10	24 - 28	Yes	28	8	X	X					X	X				ARKF, Jan. 2001
Monitoring Well	MW-2/DP-1	8 - 12	Yes	28		X	X					X	X				ARKF, Jan. 2001
	MW-2/DP-1	20 - 24	Yes	28		X	X					X	X				ARKF, Jan. 2001
Monitoring Well	MW-3/DP-9	24 - 28	Yes	40		X	X					X	X				ARKF, Jan. 2001
	MW-3/DP-9	28 - 32	Yes	40		X	X					X	X				ARKF, Jan. 2001
Monitoring Well	MW-4/DP-3	6 - 8	Yes	28	24	X	X					X	X				ARKF, Jan. 2001
	MW-4/DP-3	24 - 28	Yes	28	24	X	X					X	X				ARKF, Jan. 2001
Monitoring Well	MW-5/DP-11	0 - 2	Yes	32		X	X					X	X		X		ARKF, Jan. 2001
	MW-5/DP-11	6 - 8	Yes	32		X	X					X	X		X		ARKF, Jan. 2001
	MW-5/DP-11	24 - 26	Yes	32		X	X					X	X		X		ARKF, Jan. 2001
Monitoring Well	MW-6/DP-12	0 - 2	Yes	32		X	X					X	X		X		ARKF, Jan. 2001
	MW-6/DP-12	4 - 6	Yes	32		X	X					X	X		X		ARKF, Jan. 2001
	MW-6/DP-12	31.5 - 32	Yes	32		X	X					X	X		X		ARKF, Jan. 2001
Monitoring Well	MW-7/DP-13	0 - 2	Yes	32		X	X					X	X		X		ARKF, Jan. 2001
	MW-7/DP-13	2 - 4	Yes	32			X					X	X		X		ARKF, Jan. 2001
	MW-7/DP-13	4 - 6	Yes	32		X	X					X	X		X		ARKF, Jan. 2001
	MW-7/DP-13	24 - 26	Yes	32		X	X					X	X		X		ARKF, Jan. 2001
Surface Soil	S-1	3 - 5							X		X					Sample collected below 3-ft thick floor.	ARKF, Jan. 2001
Surface Soil	S-2	3 - 5							X		X					Sample collected below 3-ft thick floor.	ARKF, Jan. 2001
Surface Soil	S-3	3 - 5				X			X		X					Sample collected below 3-ft thick floor; VOC data also collected.	ARKF, Jan. 2001
Surface Soil	S-4	3 - 5							X		X					Sample collected below 3-ft thick floor.	ARKF, Jan. 2001
Surface Soil	S-5	3 - 5							X		X					Sample collected below 3-ft thick floor.	ARKF, Jan. 2001

Table 2-3
Historic Laboratory Sample Summary - Soils
Metropolitan Former MGP
124 - 136 Second Avenue, Brooklyn, NY

Location Type	Location ID	Sample Depth (ft bgs)	Boring Log Available	Total Boring Depth (ft bgs)	Excavation Depth (ft bgs)	SOIL										Comments	Source
						VOC	SVOC	PAH	METALS	CYANIDE	TCLP METALS	H2S RELEASED FROM WASTE	LEACHABLE AMENABLE CYANIDE	LEACHABLE TOC	DRO/GRO		
Surface Soil	S-6	3 - 5							X		X					Sample collected below 3-ft thick floor.	ARKF, Jan. 2001
Surface Soil	S-7	3 - 5							X		X					Sample collected below 3-ft thick floor.	ARKF, Jan. 2001
Surface Soil	S-8	0 - 2							X		X					Sample collected below 3-ft thick floor.	ARKF, Jan. 2001
Surface Soil	S-9	0 - 2							X		X					Sample collected below 3-ft thick floor.	ARKF, Jan. 2001
Surface Soil	S-10	2 - 4							X		X					Sample collected below 3-ft thick floor.	ARKF, Jan. 2001
Surface Soil	S-11	2 - 4							X		X					Sample collected below 3-ft thick floor.	ARKF, Jan. 2001
Surface Soil	S-12	2 - 4							X		X					Sample collected below 3-ft thick floor.	ARKF, Jan. 2001
Boring	GP-1	8 12	Yes	16		X		X									ARKF, July 2001
Boring	GP-2	6 8	Yes	8	8	X		X									ARKF, July 2001
Boring	GP-3	8 12	Yes	16	8	X		X									ARKF, July 2001
Boring	GP-4	4 8				X		X									ARKF, July 2001
Boring	GP-5	8 11				X		X									ARKF, July 2001
Boring	GP-6	8 11	Yes	11		X		X									ARKF, July 2001
Boring	GP-10	8 12			11	X		X									ARKF, July 2001
Boring	GP-15	8 12	Yes	16	15	X		X									ARKF, July 2001
Boring	GP-16	12 16	Yes	16	11	X		X									ARKF, July 2001
Boring	GP-17	12 16	Yes	16		X		X									ARKF, July 2001
Boring	GP-18	4 8	Yes	16		X		X									ARKF, July 2001
Boring	GP-19	12 16	Yes	16		X		X									ARKF, July 2001
Boring	GP-20	12 16	Yes	16		X		X									ARKF, July 2001
Boring	GP-21	8 12	Yes	16		X		X									ARKF, July 2001
Boring	GP-22	4 8	Yes	16		X		X									ARKF, July 2001
Boring	GP-23	6 8	Yes	16	8	X		X									ARKF, July 2001
Boring	GP-24	10 12	Yes	16	8	X		X									ARKF, July 2001
Boring	GP-25	12 16	Yes	16	8	X		X									ARKF, July 2001
Boring	GP-26	15 16	Yes	16	8	X		X									ARKF, July 2001
Boring	GP-28	15 16	Yes	16		X		X									ARKF, July 2001
Boring	GP-29	4 5	Yes	12	22	X		X									ARKF, July 2001
Boring	GP-31	8 12	Yes	16	6	X		X									ARKF, July 2001
Boring	GP-32	4 8	Yes	16	8	X		X									ARKF, July 2001
Boring	GP-33	4 8	Yes	16	8	X		X									ARKF, July 2001
Boring	GP-35	6 8			12	X		X									ARKF, July 2001
Boring	GP-36	4 8				X		X									ARKF, July 2001
Boring	GP-38	10 12				X		X									ARKF, July 2001
Boring	GP-39	12 16				X		X									ARKF, July 2001
Boring	GP-44	9 11	Yes	16		X		X									ARKF, July 2001
Boring	GP-46	6 7	Yes	20		X		X									ARKF, July 2001
Boring	GP-52	6 8				X		X									ARKF, July 2001
Boring	GP-54	5 8	Yes	16		X		X									ARKF, July 2001

Table 2-4
Historic Laboratory Sample Summary - Groundwater
Metropolitan Former MGP
124 - 136 Second Avenue, Brooklyn, NY

Location Type	Location ID	Screened interval (ft bgs)		Boring Log Available	Total Boring Depth (ft bgs)	Excavation Depth (ft bgs)	GROUNDWATER				Comments	Source
							VOC	SVOC	PAH	METALS		
Monitoring Well	SP-1/GWP-1					15	X	X		X	Document text states metals were analyzed; and although the analysis for metals was requested on COC, no lab data provided anywhere in report.	Nelson, Pope and Voorhis, June 1997
Monitoring Well	SP-2/GWP-2					11	X	X		X	Document text states metals were analyzed; and although the analysis for metals was requested on COC, no lab data provided anywhere in report.	Nelson, Pope and Voorhis, June 1997
Monitoring Well	SP-3/GWP-3						X	X		X	Document text states metals were analyzed; and although the analysis for metals was requested on COC, no lab data provided anywhere in report.	Nelson, Pope and Voorhis, June 1997
Monitoring Well	SP-4/GWP-4						X	X		X	Document text states metals were analyzed; and although the analysis for metals was requested on COC, no lab data provided anywhere in report.	Nelson, Pope and Voorhis, June 1997
Monitoring Well	SP-6/GWP-6						X	X		X	Document text states metals were analyzed; and although the analysis for metals was requested on COC, no lab data provided anywhere in report.	Nelson, Pope and Voorhis, June 1997
Monitoring Well	MW-1						X	X				Nelson, Pope and Voorhis, June 1997
Monitoring Well	MW-2						X	X				Nelson, Pope and Voorhis, June 1997
Monitoring Well	MW-3						X	X				Nelson, Pope and Voorhis, June 1997
Monitoring Well	MW-4						X	X				Nelson, Pope and Voorhis, June 1997
Monitoring Well	MW-5					24	X	X				Nelson, Pope and Voorhis, June 1997
Monitoring Well	AMW-1						X	X				ARKF, Jan. 2001
Monitoring Well	AMW-2						X	X				ARKF, Jan. 2001
Monitoring Well	MW-2/DP-1	5	-	25	Yes	28	X	X				ARKF, Jan. 2001
Monitoring Well	MW-3/DP-9	5	-	25	Yes	40	X	X				ARKF, Jan. 2001
Monitoring Well	MW-4/DP-3	5	-	25	Yes	28	24	X	X			ARKF, Jan. 2001
Monitoring Well	MW-5/DP-11	3	-	30	Yes	32		X	X			ARKF, Jan. 2001
Monitoring Well	MW-6/DP-12	5	-	25	Yes	32		X	X			ARKF, Jan. 2001
Monitoring Well	MW-7/DP-13	5	-	25	Yes	32		X	X			ARKF, Jan. 2001
Monitoring Well	MW-8/DP-14						X	X			Data provided in summary table for MW-8. However, text states that DP-14 could not be advanced due to refusal and concrete in location. But then the text states a well was installed and sampled at MW-8, and the log in in Appendix A - which is not included.	ARKF, Jan. 2001
Monitoring Well	C-1S/D						X		X		Shallow and deep well.	ARKF, July 2001
Monitoring Well	C-2S/D						X		X		Shallow and deep well.	ARKF, July 2001
Monitoring Well	C-3S/D						X		X		Shallow and deep well.	ARKF, July 2001
Monitoring Well	C-4S/D						X		X		Shallow and deep well.	ARKF, July 2001
Monitoring Well	C-5S/D						X		X		Shallow and deep well.	ARKF, July 2001
Monitoring Well	C-6S/D					11	X		X		Shallow and deep well.	ARKF, July 2001
Monitoring Well	MW-9						X		X		Deep well.	ARKF, July 2001
Monitoring Well	MW-10						X		X		Deep well.	ARKF, July 2001

Table 2-5
Historic Laboratory Sample Summary - Soil Gas
Metropolitan Former MGP
124 - 136 Second Avenue, Brooklyn, NY

Location Type	Location ID	Excavated	SOIL GAS		Comments	Source
			VOC	SVOC		
Soil Gas	SG-3		X	X		ARKF, Jan. 2001
Soil Gas	SG-4		X	X		ARKF, Jan. 2001
Soil Gas	SG-5		X	X		ARKF, Jan. 2001
Soil Gas	SG-6		X	X		ARKF, Jan. 2001
Soil Gas	SG-8			X		ARKF, Jan. 2001

Notes:

Due to shallow groundwater, soil gas samples were collected < 4 feet.

Table 3-1
Proposed RI Sample Location, Rationale, and Analytical Sample Summary
Metropolitan Former MGP, 124-136 Second Avenue, Brooklyn, New York

Location ID	Sample ID	Completion Depth*	Sample Depth	No. of Samples	Analyses	Rationale
Surface Soil/Subsurface Soil						
SS-1	SS-1 (depth)	2 inches	Surface (0 - 2 inches)	1	TCL VOCs, TCL SVOCs, TAL Metals, Free CN, PCBs (as Aroclors), TCL Pesticides & Herbicides	Evaluate existing surface soil on Site. Located on west side of Pathmark building between building and canal at SB-9/MW-9 location.
SS-2	SS-2 (depth)	2 inches	Surface (0 - 2 inches)	1	VOCs, SVOCs, RCRA 8 Metals, and Free CN	Evaluate existing surface soil on Site. Location to be determined pending areas of surface soil identified on Site.
SS-3	SS-3 (depth)	2 inches	Surface (0 - 2 inches)	1	VOCs, SVOCs, RCRA 8 Metals, and Free CN	Evaluate existing surface soil on Site. Location to be determined pending areas of surface soil identified on Site.
SB-1	SB-1 (depth)	Est. 70 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	VOCs, SVOCs, RCRA 8 Metals, and Free CN	Anticipated upgradient location. Evaluate background soil quality in site area near eastern edge of former MGP footprint and elevated PID at LB-8 (35-55 feet bgs).
SB-2	SB-2 (depth)	Est. 70 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	VOCs, SVOCs, RCRA 8 Metals, and Free CN	Evaluate soils adjacent to former Holders 2 and 3. Likely downgradient from former bulk oil storage beneath Lowes building. Evaluate extent of elevated PID at LB-7 (33-55 feet bgs).
SB-3	SB-3 (depth)	Est. 70 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	VOCs, SVOCs, RCRA 8 Metals, and Free CN	Evaluate soils adjacent to former Holder 5 and downgradient of primary NAPL producing recovery wells RW9 through RW-13 and RW-39 and 40.
SB-4	SB-4 (depth)	Est. 50 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	VOCs, SVOCs, RCRA 8 Metals, and Free CN	Evaluate soils adjacent to former generator house and tar tank area along western site boundary. Likely down-gradient boundary of former MGP footprint by Gowanus Canal. Evaluate potential inputs from Brooklyn Alcatraz Asphalt Company.
SB-5	SB-5 (depth)	Est. 50 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	TCL VOCs, TCL SVOCs, TAL Metals, Free CN, PCBs (as Aroclors), TCL Pesticides & Herbicides	Evaluate soils along western site boundary. Likely down-gradient boundary of former MGP footprint by Gowanus Canal. Evaluate potential inputs from Brooklyn Alcatraz Asphalt Company.
SB-6	SB-6 (depth)	Est. 50 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	TCL VOCs, TCL SVOCs, TAL Metals, Free CN, PCBs (as Aroclors), TCL Pesticides & Herbicides	Evaluate soil adjacent to former gas holder in southern portion of former MGP footprint. Likely cross-gradient/down-gradient location.
SB-7	SB-7 (depth)	Est. 50 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	VOCs, SVOCs, RCRA 8 Metals, and Free CN	Evaluate soil adjacent to former operations and gas holder in southern portion of former MGP footprint. Likely cross-gradient/down-gradient location. Evaluate potential inputs from Brooklyn Alcatraz Asphalt Company.
SB-8	SB-8 (depth)	Est. 70 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	TCL VOCs, TCL SVOCs, TAL Metals, Free CN, PCBs (as Aroclors), TCL Pesticides & Herbicides	Evaluate soils adjacent to former operations area/Holder 4 in central/western portion of former MGP footprint. Attempt to delineate deep impacts noted at RB-1 to east adjacent to Holder 1.
SB-9	SB-9 (depth)	Est. 70 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	VOCs, SVOCs, RCRA 8 Metals, and Free CN	Evaluate former tar tank area adjacent to Gowanus Canal along western boundary of former MGP.
SB-10	SB-10 (depth)	Est. 50 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	VOCs, SVOCs, RCRA 8 Metals, and Free CN	Previously un-investigated area W/SW of former MGP. Evaluate possible inputs from Brooklyn Alcatraz Asphalt Company.
SB-11	SB-11 (depth)	Est. 50 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	VOCs, SVOCs, RCRA 8 Metals, and Free CN	Previously un-investigated area west of former Holders 1 and 2 and N/NW of former Holder 5.
SB-12	SB-12 (depth)	Est. 50 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	VOCs, SVOCs, RCRA 8 Metals, and Free CN	Evaluate former Holder 5 along southern boundary of former MGP footprint. Delineate LB-5 impacts at 27-32 feet bgs.
SB-13	SB-13 (depth)	Est. 70 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	VOCs, SVOCs, RCRA 8 Metals, and Free CN	Evaluate soils W/SW of former Holders 1 and 2. Evaluate deep impacts to east at RB-1, LB-2, and LB-5, where impacts noted at depths up to 67 feet bgs.
SB-14	SB-14 (depth)	Est. 70 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	TCL VOCs, TCL SVOCs, TAL Metals, Free CN, PCBs (as Aroclors), TCL Pesticides & Herbicides	Evaluate soils west of Holders 2 and 3 and downgradient of primary NAPL producing recovery wells RW9 through RW-13 and RW-39 and 40.
SB-15	SB-15 (depth)	Est. 70 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	VOCs, SVOCs, RCRA 8 Metals, and Free CN	Evaluate contents of edge of Holder 5 foundation (if present). Evaluate soils west of former Holder 2 and downgradient of primary NAPL producing recovery wells RW9 through RW-13 and RW-39 and 40.
SB-16	SB-16 (depth)	Est. 70 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	VOCs, SVOCs, RCRA 8 Metals, and Free CN	Evaluate soils west of former Holder 1 and adjacent to former shaving scrubbers. Evaluate potential extent of deep impacts to east at RB-1, LB-2, and LB-5, where impacts noted at depths up to 67 feet bgs.
SB-17	SB-17 (depth)	Est. 50 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	VOCs, SVOCs, RCRA 8 Metals, and Free CN	Evaluate soils adjacent to former tar extractors and condensers along 12th Street.
SB-18	SB-18 (depth)	Est. 70 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	VOCs, SVOCs, RCRA 8 Metals, and Free CN	Evaluate soils downgradient of former tar extractors and condensers along 12th Street.
TP-1	TP-1 (distance/depth)	Est. 8-10 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	VOCs, SVOCs, RCRA 8 Metals, and Free CN	Evaluate location and contents of former Holder 5, valve house area, and coal line along 12th Street.
TP-2	TP-2 (distance/depth)	Est. 8-10 feet max	Upper 5 feet, zone of worst-case impacts, and first clean or bottom	3	VOCs, SVOCs, RCRA 8 Metals, and Free CN	Evaluate location and contents of former Holder 5 and valve house area adjacent to current building.

Table 3-1
Proposed RI Sample Location, Rationale, and Analytical Sample Summary
Metropolitan Former MGP, 124-136 Second Avenue, Brooklyn, New York

Location ID	Sample ID	Completion Depth*	Sample Depth	No. of Samples	Analyses	Rationale
Groundwater						
MW-1	MW-1S/I/D (date)	S-est. 15 ft, I est. 40 ft, D est. 70 ft	S ~ 5-15 ft., I ~ 30-40 ft., D ~ 60-70 ft.	3	VOCs, SVOCs, RCRA 8 Metals, and Total CN	Anticipated upgradient/background location. Evaluate background groundwater quality in site area above "meadow mat", in upper portion of semi-confirmed aquifer, and deeper zone within lower aquifer.
MW-2	MW-2D (date)	Est 70 feet	Est. 60-70 ft.	1	VOCs, SVOCs, RCRA 8 Metals, and Total CN	Anticipated cross-gradient location adjacent to former Holders 2 and 3. Evaluate deeper zone within lower aquifer. Shallow and intermediate groundwater data available from adjacent site RWs.
MW-3	MW-3S/I (date)	S-est. 15 ft, I est. 50 ft	S ~ 5-15 ft., I ~ 25-50 ft.	2	VOCs, SVOCs, RCRA 8 Metals, and Total CN	Anticipated downgradient location of primary NAPL producing recovery wells RW9 through RW-13 and RW-39 and 40. Evaluate possible lateral extent of impacts noted in these RWs. Screened interval set to be consistent with RWs.
MW-4	MW-4S/I (date)	S-est. 15 ft, I est. 40 ft	S ~ 5-15 ft., I ~ 30-40 ft.	2	VOCs, SVOCs, RCRA 8 Metals, and Total CN	Anticipated downgradient site boundary location adjacent to Gowanus Canal. Evaluate potential inputs from Brooklyn Alcatraz Asphalt Company. Evaluate groundwater flux/gradients into canal above "meadow mat" and in upper portion of semi-confirmed aquifer.
MW-5	MW-5S/I/D (date)	S-est. 15 ft, I est. 40 ft, D est. 70 ft	S ~ 5-15 ft., I ~ 30-40 ft., D ~ 60-70 ft.	3	TCL VOCs, TCL SVOCs, TAL Metals, Total CN, PCBs (as Aroclors), TCL Pesticides & Herbicides	Anticipated downgradient site boundary location adjacent to Gowanus Canal. Evaluate potential inputs from Brooklyn Alcatraz Asphalt Company. Evaluate groundwater flux/gradients into canal above "meadow mat" and in upper portion of semi-confirmed aquifer.
MW-6	MW-6S/I (date)	S-est. 15 ft, I est. 40 ft	S ~ 5-15 ft., I ~ 30-40 ft.	2	TCL VOCs, TCL SVOCs, TAL Metals, Total CN, PCBs (as Aroclors), TCL Pesticides & Herbicides	Anticipated downgradient/cross-gradient site boundary location adjacent to former southern gas holder along southern/western boundary of site.
MW-7	MW-7S/I (date)	S-est. 15 ft, I est. 40 ft	S ~ 5-15 ft., I ~ 30-40 ft.	2	VOCs, SVOCs, RCRA 8 Metals, and Total CN	Anticipated downgradient/cross-gradient site boundary location adjacent to former southern gas holder and operations area along southern/western boundary of site. Evaluate potential inputs from Brooklyn Alcatraz Asphalt Company.
MW-8	MW-8S/I (date)	S-est. 15 ft, I est. 40 ft	S ~ 5-15 ft., I ~ 30-40 ft.	2	TCL VOCs, TCL SVOCs, TAL Metals, Total CN, PCBs (as Aroclors), TCL Pesticides & Herbicides	Anticipated downgradient location. Evaluate impacts noted near former Holder 1 to the east. Potential centerline plume location adjacent to Pathmark building.
MW-9	MW-9S/I/D (date)	S-est. 15 ft, I est. 40 ft, D est. 70 ft	S ~ 5-15 ft., I ~ 30-40 ft., D ~ 60-70 ft.	3	VOCs, SVOCs, RCRA 8 Metals, and Total CN	Anticipated downgradient site boundary location adjacent to Gowanus Canal and former tar tanks. Evaluate groundwater flux/gradients into canal at three aquifer depth intervals.
Soil Vapor/Indoor Air/Ambient Air						
SV-1/IA-1	SV-1 (date); IA-1 (date)	Immediately below floor slab		2	VOCs (TO-15) + Naphthalene	Satisfy requirements of the NYSDOH Soil Vapor Intrusion Guidance. The sample will be collected with co-located indoor air sample in Pathmark building.
SV-2/IA-2	SV-2 (date); IA-2 (date)	Immediately below floor slab		2	VOCs (TO-15) + Naphthalene	Satisfy requirements of the NYSDOH Soil Vapor Intrusion Guidance. The sample will be collected with co-located indoor air sample inside Pathmark building.
SV-3/IA-3	SV-3 (date); IA-3 (date)	Immediately below floor slab		2	VOCs (TO-15) + Naphthalene	Satisfy requirements of the NYSDOH Soil Vapor Intrusion Guidance. The sample will be collected with co-located indoor air sample inside building.
SV-4/IA-4	SV-4 (date); IA-4 (date)	Immediately below floor slab		2	VOCs (TO-15) + Naphthalene	Satisfy requirements of the NYSDOH Soil Vapor Intrusion Guidance. The sample will be collected with co-located indoor air sample inside building.
AMB-1	AMB-1 (date)	Ambient air		1	VOCs (TO-15) + Naphthalene	Satisfy requirements of the NYSDOH Soil Vapor Intrusion Guidance. The sample will be taken in representative background/ambient location.

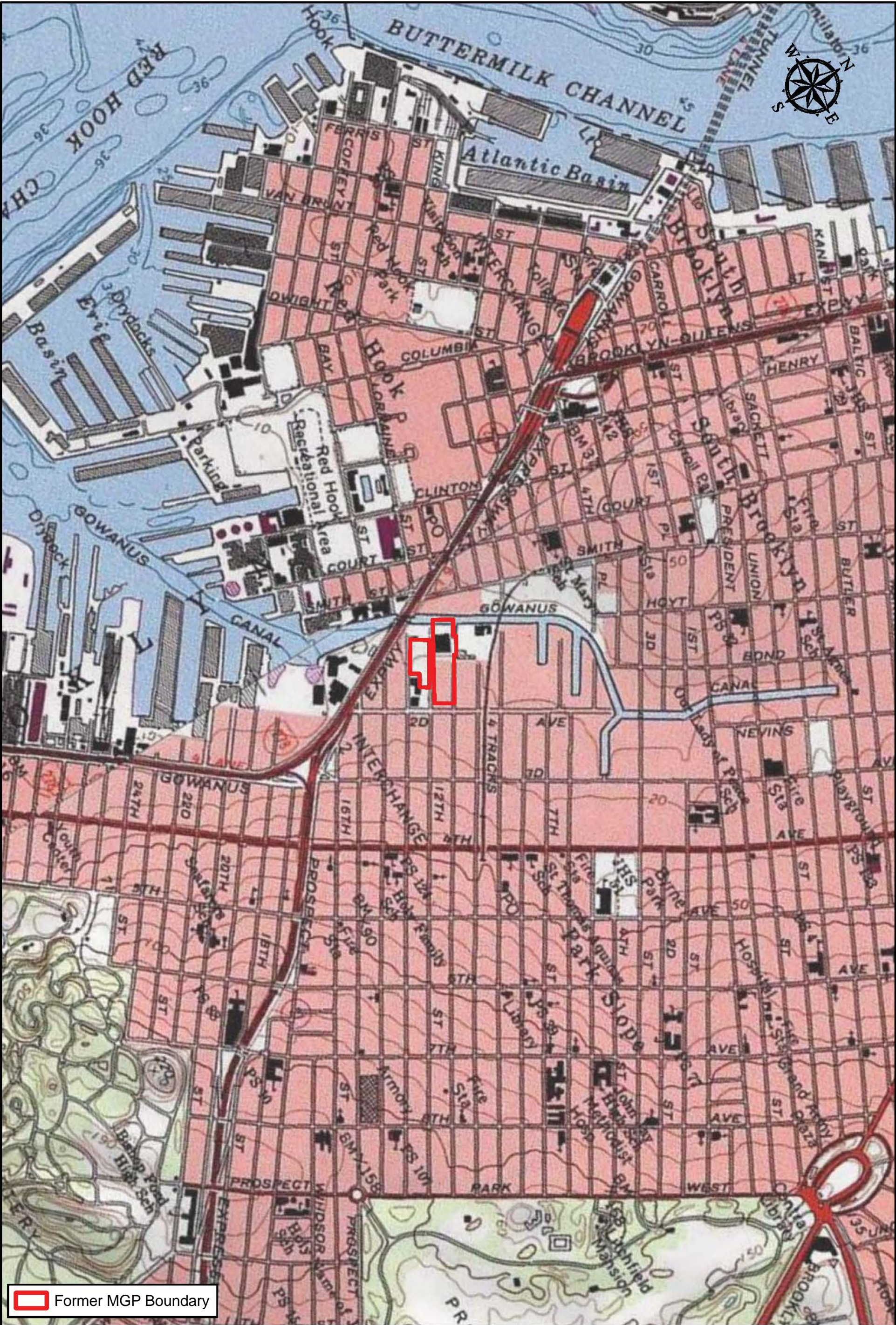
Notes

1. No. - number
2. ID - identification
3. NA - Not applicable
4. NYSDOH - New York State Department of Health
5. MGP - Manufactured Gas Plant
6. RCRA - Resource Conservation and Recovery Act
7. SS - Surface Soil
8. SB - Soil Boring (Subsurface Soil)

9. MW - Monitoring Well (Groundwater Sample)
10. SV - Soil Vapor
11. IA - Indoor Air
12. AMB - Ambient Air
13. VOCs - volatile organic compounds
14. SVOCs - semi-volatile organic compounds
15. CN - cyanide
16. * - Depths may be adjusted shallower if 10 feet into clean achieved.

Indicates interval is proposed for inclusion in the 20% of originally proposed sample to be analyzed for an expanded list of analytes.

Figures



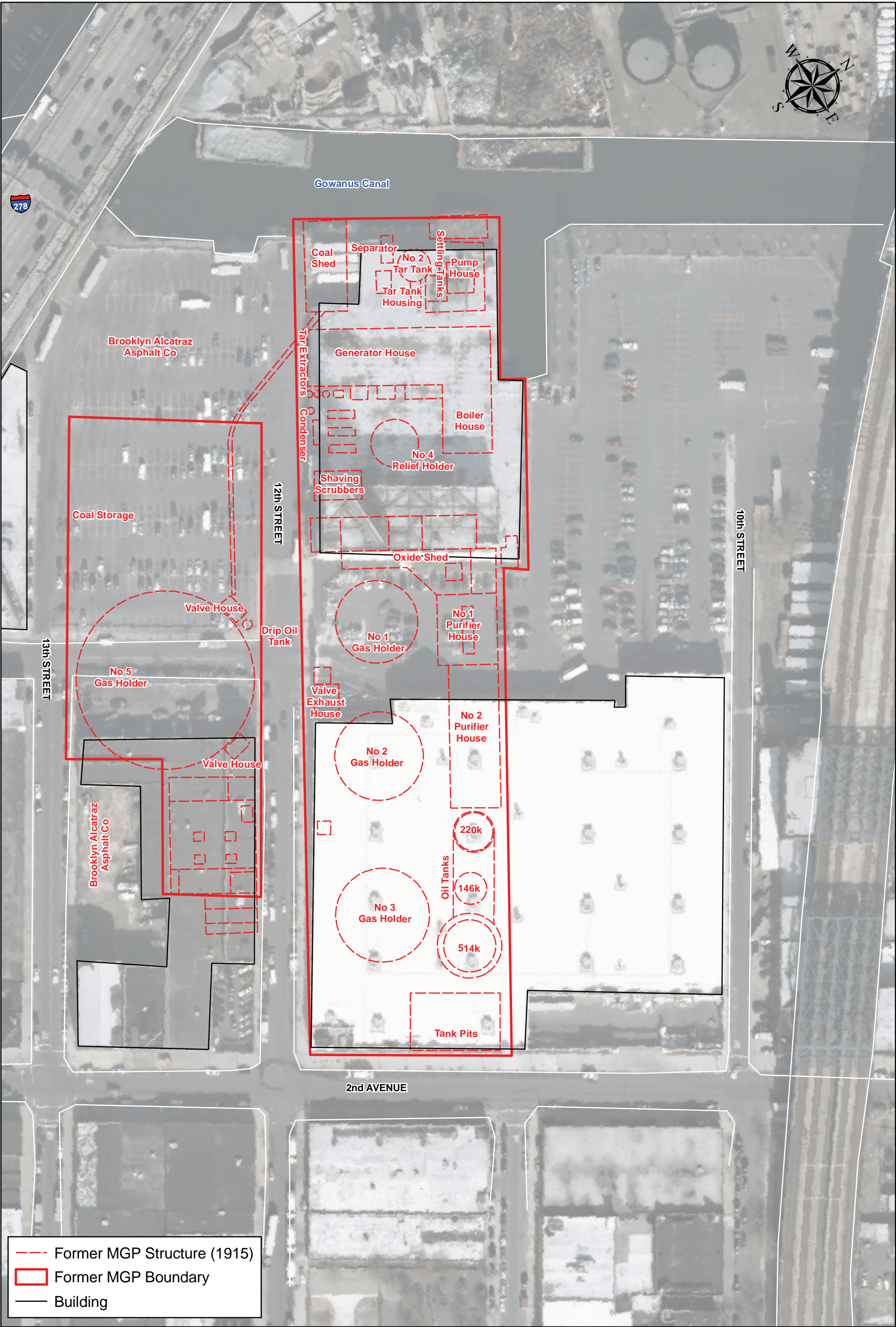
 Former MGP Boundary

AECOM

NATIONAL GRID
METROPOLITAN FORMER MGP SITE
1:12,000 1 Inch = 1000 ft
0 500 1,000 2,000 Feet

Site Location Map

Figure 1-1

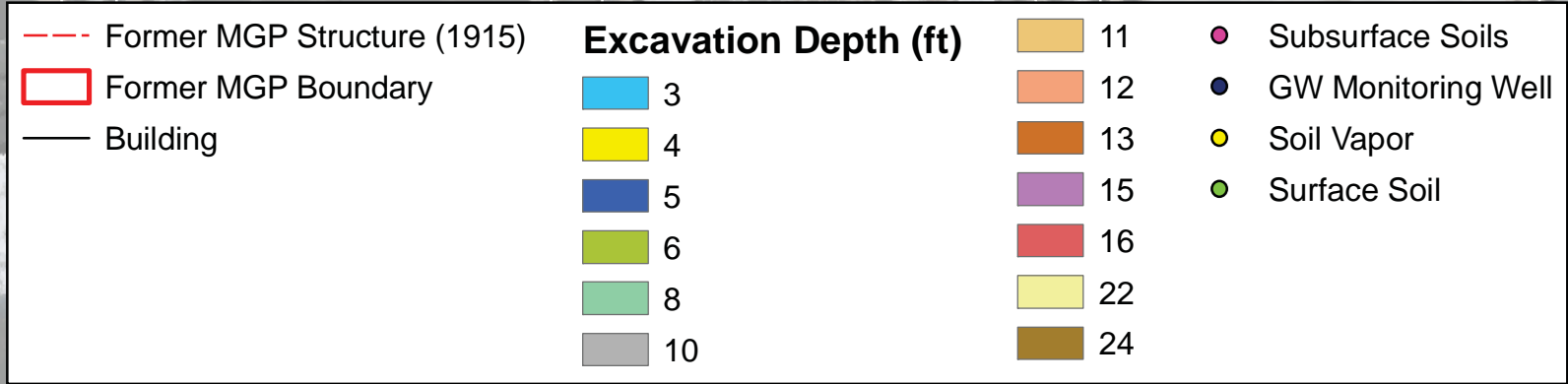
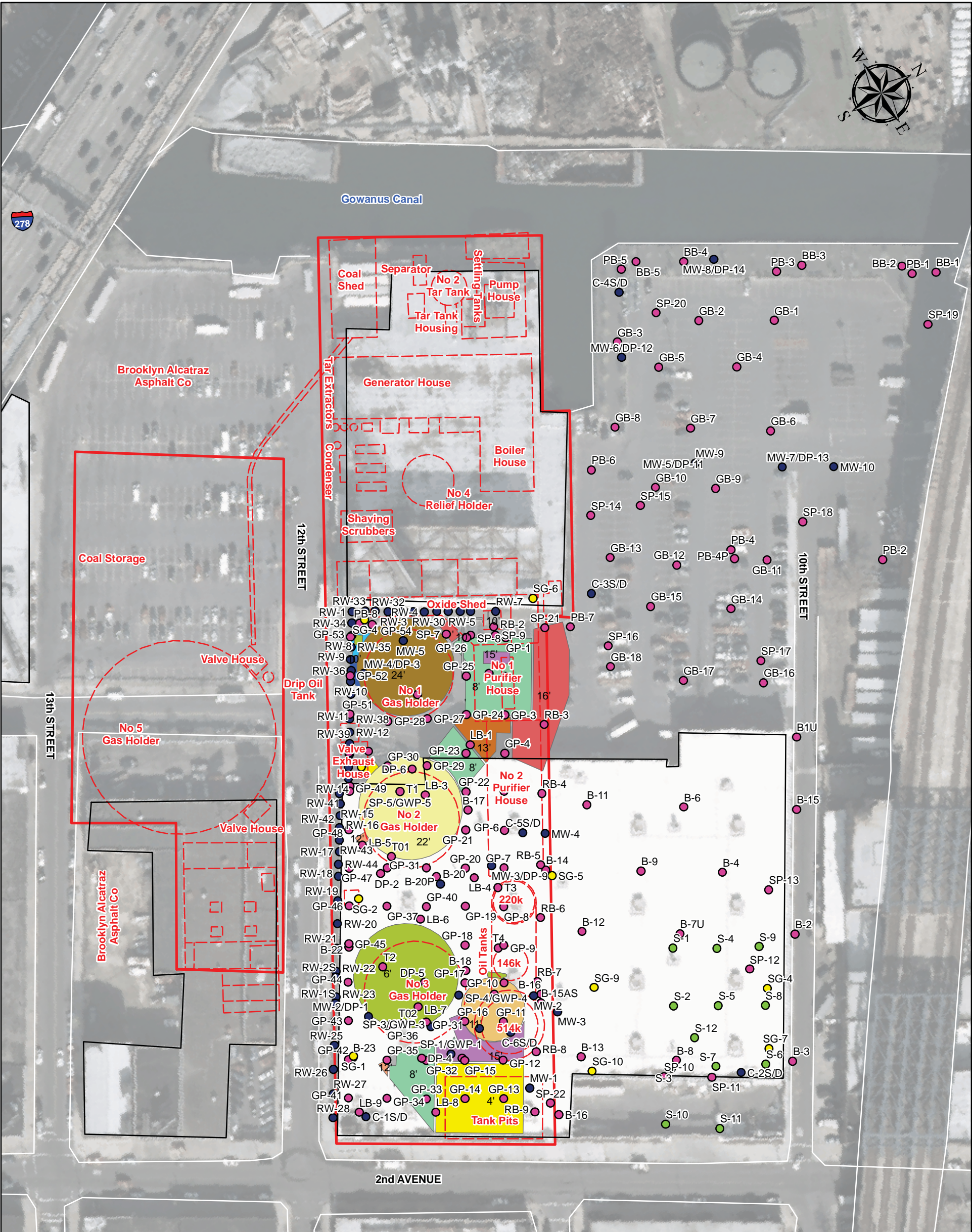


NATIONAL GRID
METROPOLITAN FORMER MGP SITE

1:1200 1 Inch = 100 ft
0 50 100 200 Feet

Historic and Current Site Features

Figure 2-1

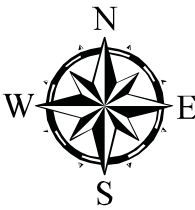
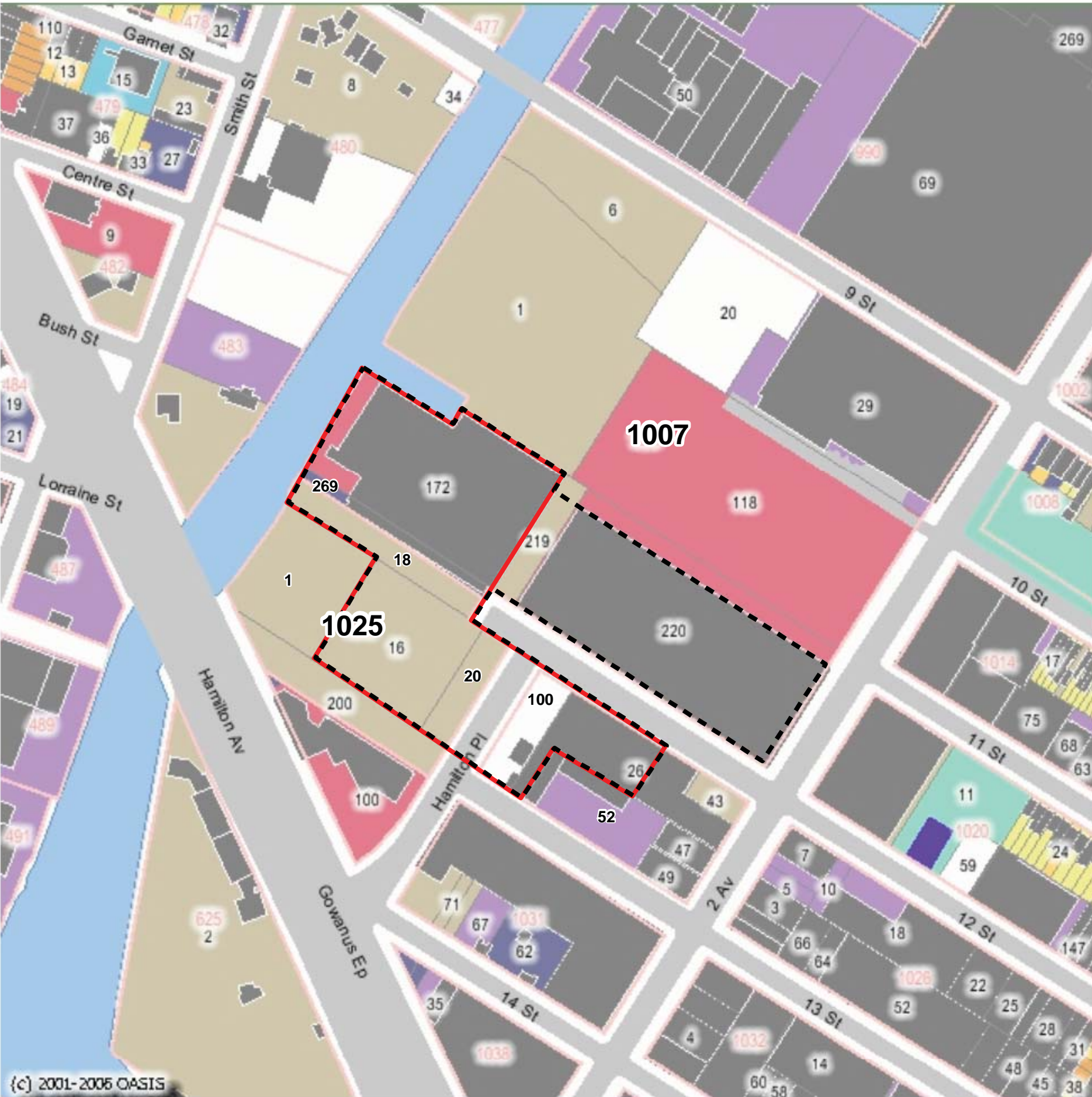


AECOM

NATIONAL GRID
METROPOLITAN FORMER MGP SITE
1:1200 1 Inch = 100 ft
0 50 100 200 Feet

Previous Investigation Locations

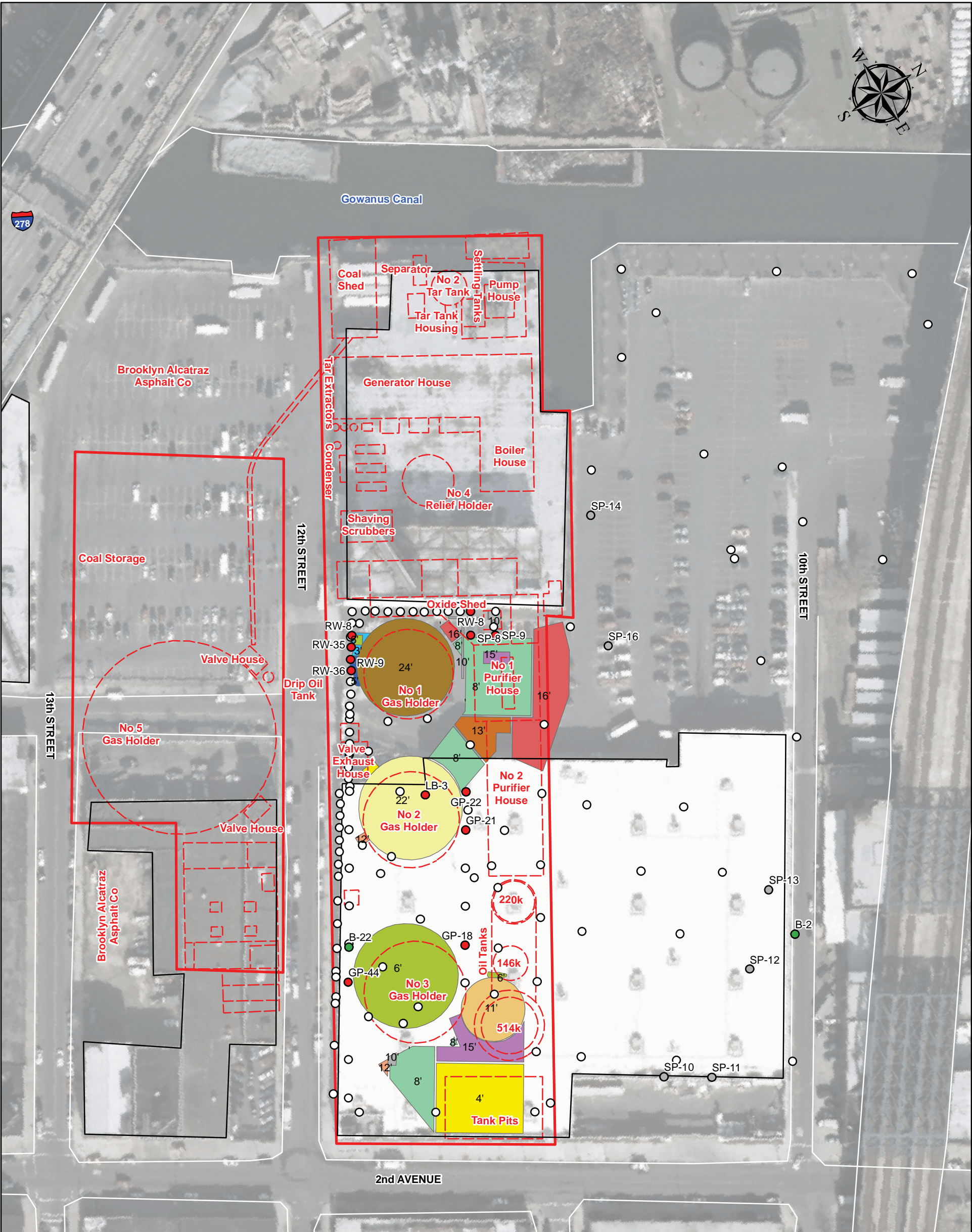
Figure 2-2



Legend

- | | | | |
|-----------------------------|---|-------------------------------------|--------------------|
| <u>Block/Lot Boundaries</u> | <u>1 & 2 Family Residential</u> | <u>Commercial</u> | <u>Industrial</u> |
| <u>Buildings</u> | <u>Multi-family Residential</u> | <u>Institutions</u> | <u>Vacant Lots</u> |
| <u>Historic Houses</u> | <u>Mixed Use</u> | <u>Transportation & Parking</u> | |
| <u>Current Site</u> | <u>Former MGP Boundary (Maximum Extent)</u> | | |

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Former MGP Structure (1915)

Former MGP Boundary

Building

Excavation Depth (ft)

3

4

5

6

8

10

11

12

13

15

16

22

24

Visible Impact 0-15 ft bgs

"Black Layer" *

NAPL/"Visible hydrocarbons"

Odors/sheens

No Visible Impact

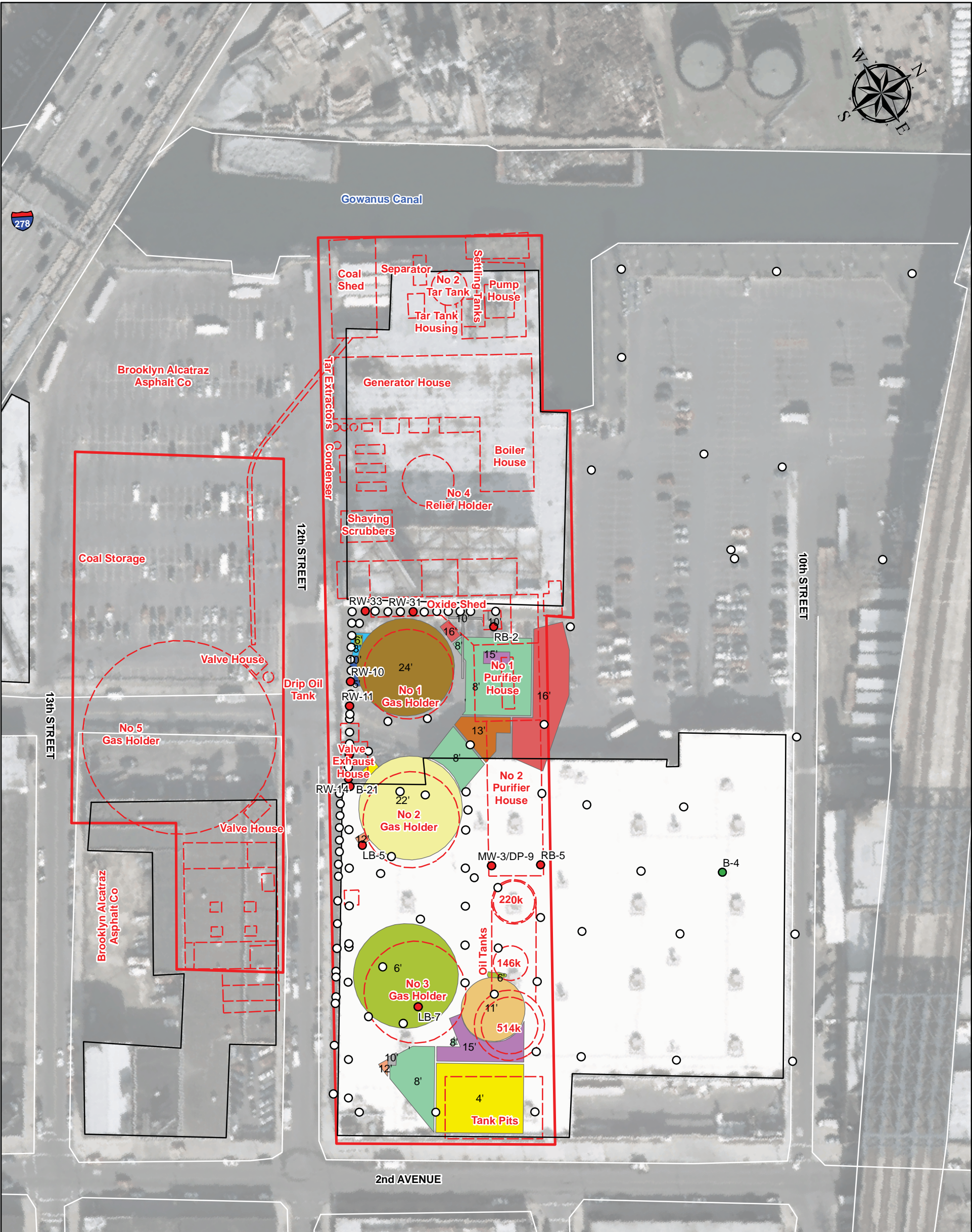
*(Nelson, Pope and Voorhis, June 1997)

AECOM

NATIONAL GRID
METROPOLITAN FORMER MGP SITE
1:1200 1 Inch = 100 ft
0 50 100 200 Feet

Visible Impacts (0-15 Feet bgs)

Figure 2-5



Former MGP Structure (1915)

Former MGP Boundary

Building

Excavation Depth (ft)

3

4

5

6

8

10

11

12

13

15

16

22

24

Visible Impact 15-30 ft bgs

NAPL/"Visible hydrocarbons"

Odors/sheens

No Visible Impact

AECOM

NATIONAL GRID

METROPOLITAN FORMER MGP SITE

1:1200 1 Inch = 100 ft

0

50

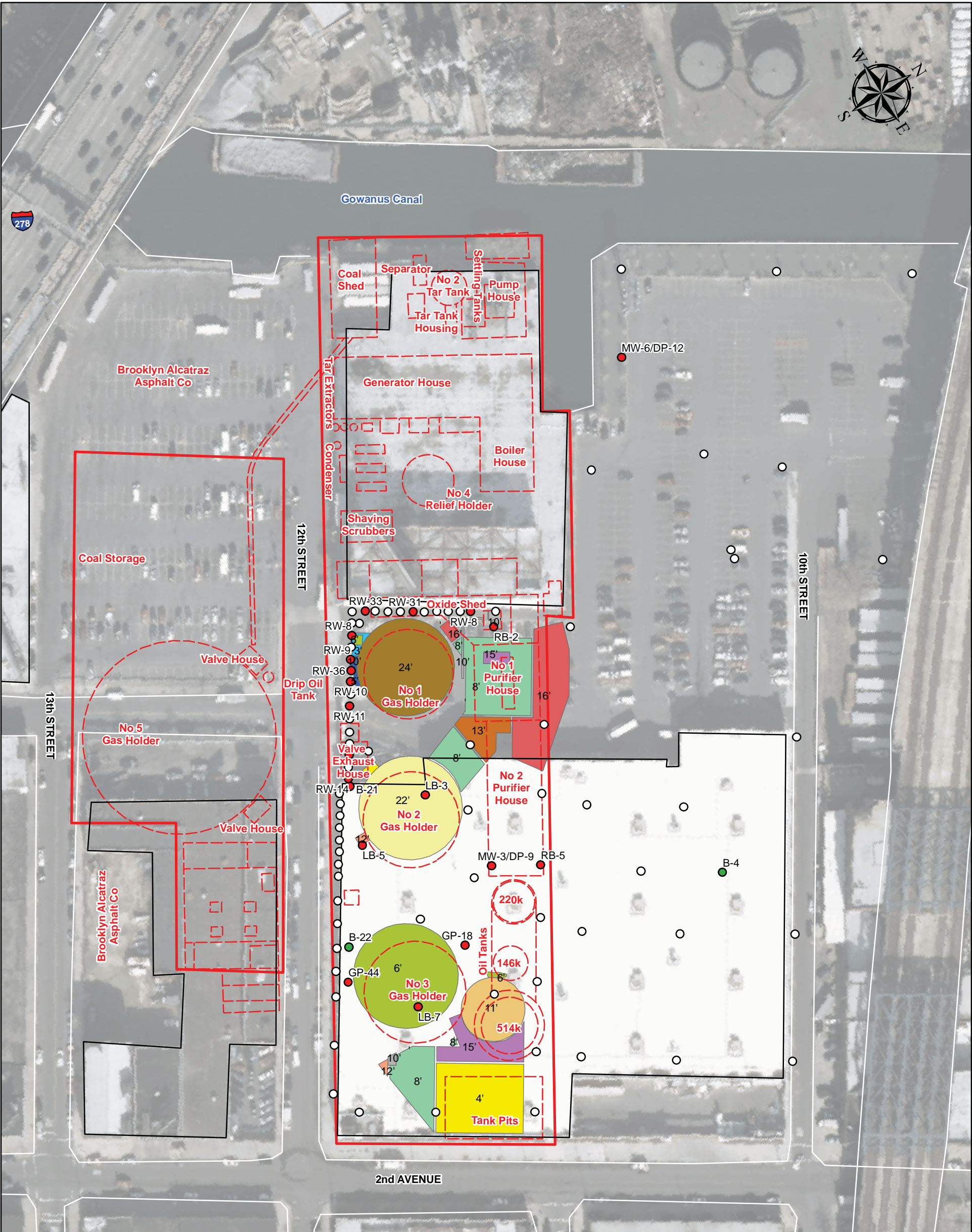
100

200

Feet

Visible Impacts (15-30 Feet bgs)

Figure 2-6



Former MGP Structure (1915)

Former MGP Boundary

Building

3

Excavation Depth (ft)

4

5

6

8

10

11

12

13

15

16

22

24

●

High PID

●

NAPL/"Visible hydrocarbons"

●

Odors/sheens

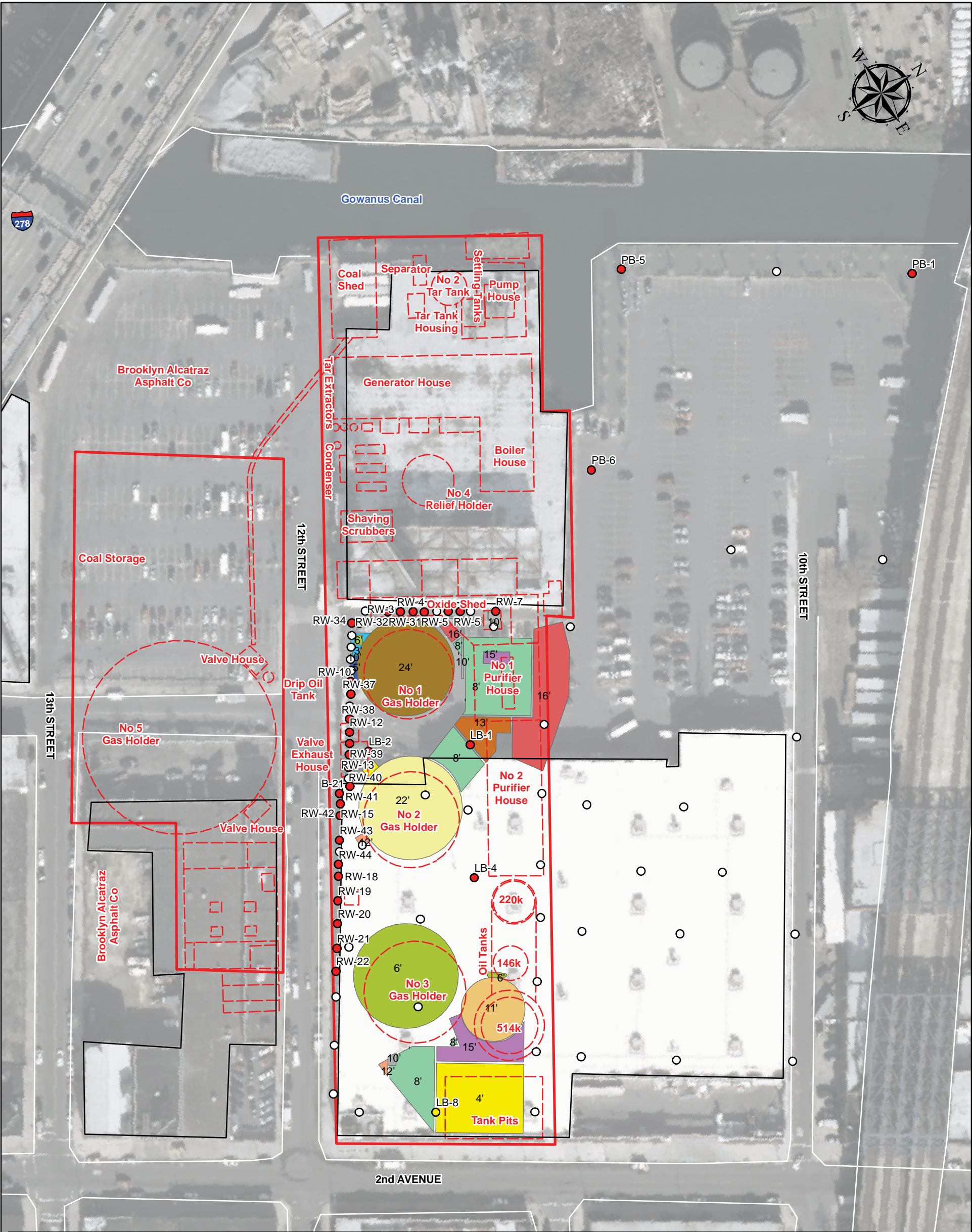
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No Visible Impact

NATIONAL GRID
METROPOLITAN FORMER MGP SITE
1:1200 1 Inch = 100 ft
0 50 100 200 Feet

Visible Impacts (30-50 Feet bgs)

Figure 2-7



Former MGP Structure (1915)

Former MGP Boundary

Building

3

Excavation Depth (ft)

4

5

6

8

10

11

Excavation Depth (ft)

12

13

15

16

22

24

●

High PID

●

NAPL/"Visible hydrocarbons"

○

No Visible Impact

Visible Impact >50 ft bgs

AECOM

NATIONAL GRID

METROPOLITAN FORMER MGP SITE

1:1200 1 Inch = 100 ft

0

50

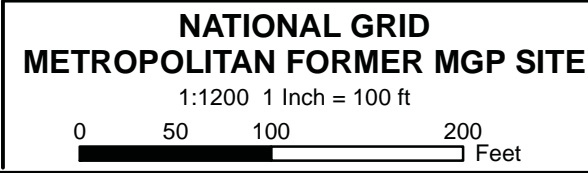
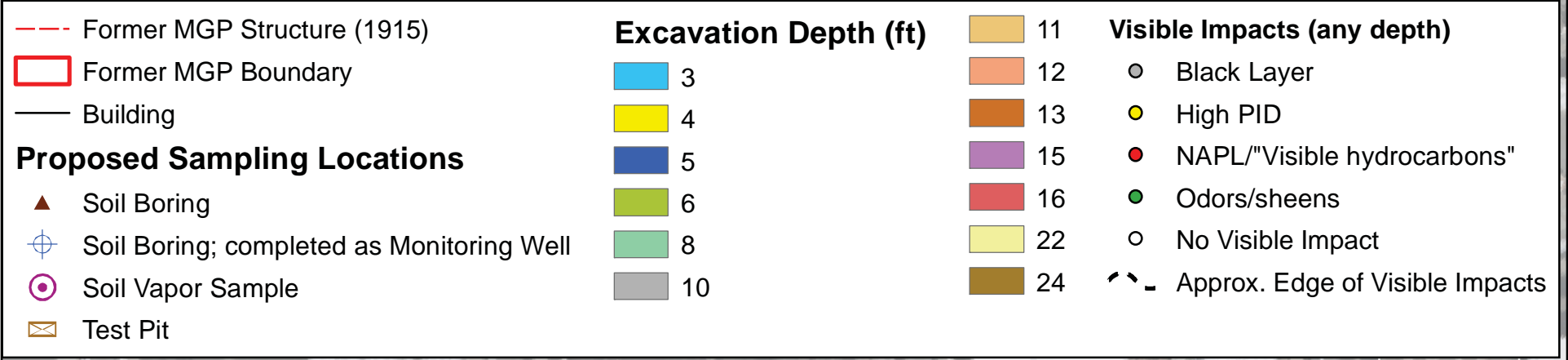
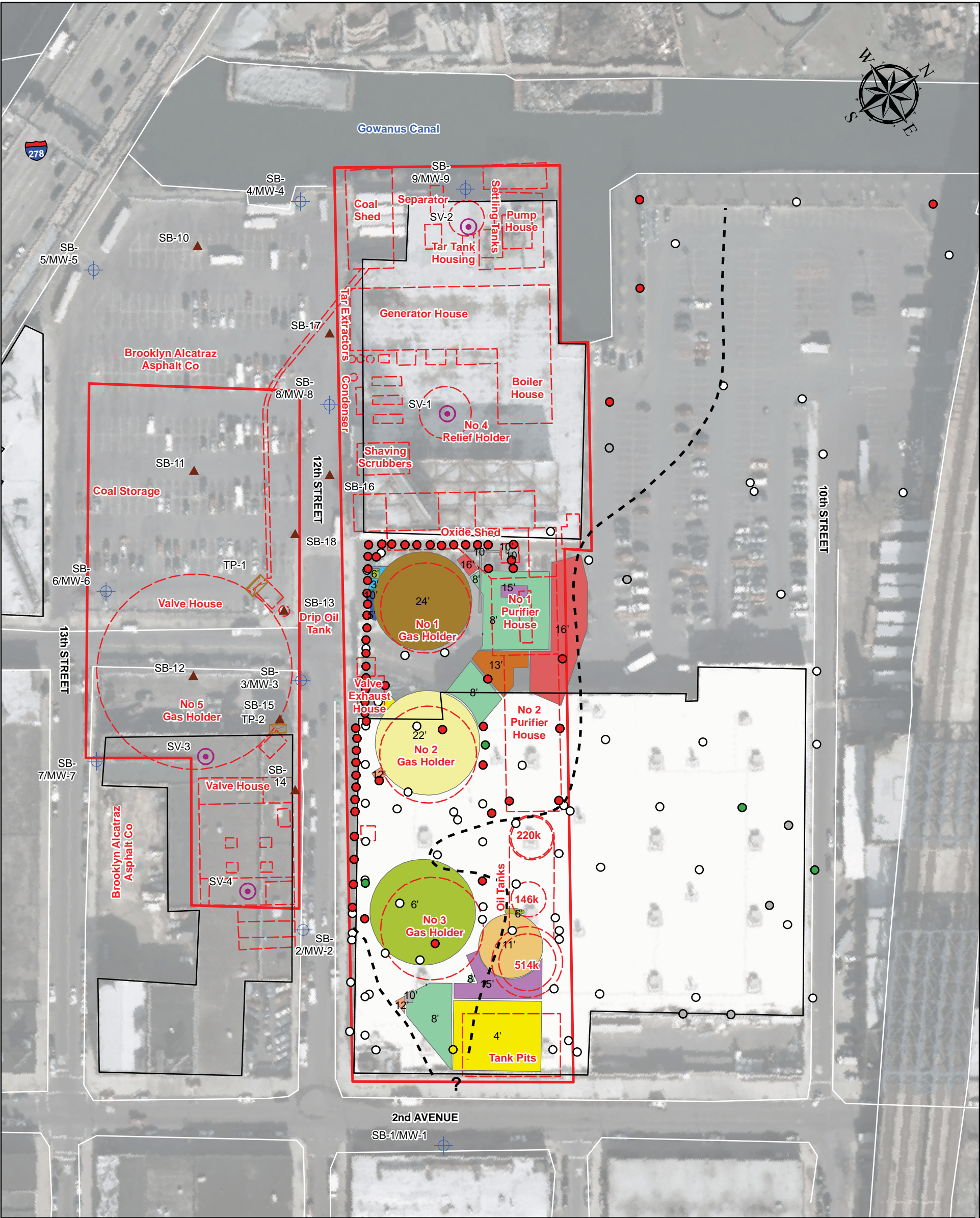
100

200

Feet

Visible Impacts (>50 Feet bgs)

Figure 2-8



Proposed Remedial Investigation
Sampling Locations

Figure 3-1